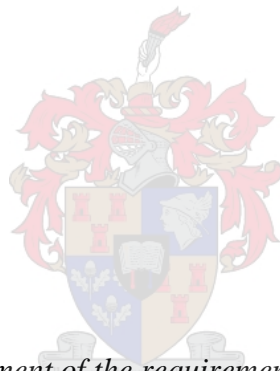


Thinking in Two Minds:  
The Role of Second Language in Risk-Taking

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*Thesis presented in fulfilment of the requirements for the degree of MA in  
General Linguistics in the Faculty of Arts and Social Sciences at  
Stellenbosch University*

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## **DECLARATION**

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Date: March 2020

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## Abstract

This study assessed the effects that language may have on an individual's decision making in scenarios that involve some type of risk. The main research questions of the study are “Do individuals with prolonged exposure to, and use of, the second language (in this case first language Afrikaans – second languages English bilinguals) exhibit the same framing effect biases documented in previous research?” and “May language background variables, and second language visualisation ability, account for the variation in the decisions made by this group?”.

The study consisted of 159 bilingual speakers (first language Afrikaans, second language English), who were randomly assigned to one of two different framing versions of the scenario, (known as the loss or gain frame), and these frames could have either been presented in Afrikaans or English. These conditions were compared and analysed for how the languages effected the choices made in the task. Participants were also presented with a classification task, in which they were assigned to match the language that was represented in the main task.

The results of this study provide a new perspective to research in this field, in that the findings were not the same as those in previous research. Participants in the second language condition should have been less effected by framing in the loss version of the task, but instead results in this condition reflect an effect of framing. Participants in the first language condition, however, replicate the results found in previous research. The results of the visualisation task also present findings different to those in previous research, in that speakers in the second language condition outperform those in the first language condition.

## Opsomming

Hierdie studie het die effekte geassesseer wat taal kan hê op 'n individu se besluitneming in scenario's wat 'n vorm van risiko inhou. Die hoof navorsingsvrae van die studie is: “Vertoon individue met verlengde blootstelling aan, en gebruik van, die tweede taal (in hierdie geval “eerste taal Afrikaans – tweede taal Engels”-tweetaliges) dieselfde beramingseffek-vooroordele wat in vorige navorsing gedokumenteer is?” en “Kan taalagtergrond-veranderlikes, en die vermoë om die tweede taal te visualiseer, rekenskap gee vir die variasie in die keuses wat gemaak is deur hierdie groep?”

Die studie het bestaan uit 159 tweetalige sprekers (eerste taal Afrikaans, tweede taal Engels) wat ewekansig gesorteer is in een van twee beramingsweergawes van die scenario, (wat bekend staan as die “verlies of wins”-raam), en hierdie rame kon in Afrikaans of Engels aangebied word. Hierdie kondisies is vergelyk en geanaliseer n.a.v. hoe die tale die keuses wat gemaak is in die taak, beïnvloed het. Deelnemers moes ook 'n klassifikasietaak doen, waarin hulle die taal gebruik het soos in die hooftaak.

Die resultate van hierdie studie verskaf 'n nuwe perspektief vir navorsers in hierdie veld, omdat die bevindinge nie dieselfde was as vir dié in vorige navorsing nie. Deelnemers in die tweede taal-kondisie moes minder geaffekteer gewees het deur beraming in die verlies-weergawe van die taak, maar in werklikheid reflekteer die resultate in hierdie kondisie 'n effek van beraming. Deelnemers in die eerste taal-voorwaarde het egter die bevindinge van vorige navorsing gerepliseer. Die resultate van die visualiseringstaak bied ook bevindinge wat anders is as dié in vorige navorsing, deurdat sprekers in die tweede taal-kondisie beter presteer het as diegene in die eerste taal-kondisie.

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# **CHAPTER ONE:**

## **INTRODUCTION**

### **1.1. Introduction**

Language is without a doubt a central tool that people use in their everyday lives to get things done. Whether this language be spoken, signed or written, language is called forth constantly to inform us on, or interpret things in our surroundings, and also to make decisions based on the information we gather through these interpretations. For many of our lively daily choices, language is usually at the core, in that we use it to take in information and to interpret things around us.

In many events in our lives, we find ourselves at a crossroad where we need to make a decision, which we consider to either be a safe choice to make, or to involve a risk. People have experiences like this all the time, for example, choosing to take the longer route home (which is the safer one), rather than taking a shortcut which has become known as a danger or risk. Many life experiences lead us to make choices we believe are best for our own wellbeing, and in some cases, even the wellbeing of others.

These things may all seem like common knowledge, or even mundane information, but what is less known is that it the language an individual speaks may both filter the way in which an individual perceives things, and it may also influence which decisions an individual feels are best suited for a given situation they find themselves in (Caldwell-Harris & Ayçiçeği-Dinn, 2009; Huang & Rau, 2018, etc.). These studies that are conducted on language effects in decision-making mainly focus on how the decision which seems best suited might differ from one language context to the next. For example, would the same individual, choose the same option for the same scenario if they are asked about it in both French and English?

These effects of language are found in moral scenarios, like the so-called trolley problem (explained in section 2.4, p. 15), where one could potentially save the lives of a handful of individuals at the cost of sacrificing others, as well as in risk situations such as the financial crisis problem, where one has to figure out how to stop the potential loss of a large amount of money. It has been shown that when bilingual individuals are asked to choose the best course of action for a given problem, they are likely to choose different options depending on which

language the problem is presented in – even in cases where the outcome remains the same (Costa, Foucart, Arnon, Aparici, & Apesteguia, 2014a). These decision-making scenarios represent the main focus of the current thesis.

## **1.2. Focus of the present research topic**

The main focus of this thesis is on the effect that a (second) language may or may not have on the decisions that individuals make in scenarios that involve some type of risk. First language (also known as L1) Afrikaans speakers, with English as a second language (also known as L2) constitute the target group for the participants in the study. When individuals are presented with risk-type problems, it is not always the case that they will choose the option that comes across as the safest one. These individuals can be influenced by the way in which the choices made available to them are presented.

The choices made available to the individual in these scenarios are either framed in terms of a gain or a loss. If the choice is framed as a gain, people are more likely to avoid any risk (or to be risk averse). When the choice instead is presented as a loss, people are more likely to take risks (or to be risk seeking) (Winsky, et al., 2016). A gain, then, would concern how many lives or how much money an individual can save when deciding between the options presented to them, whereas a loss would describe how much could be lost. Non-native languages tend to blur the lines of preference when it comes to being risk-seeking in the loss versions of tasks.

It would also be important, in this context, to take into account how a second language might have an influence on the ability of a person to visualise a scenario. Hayakawa and Keysar (2018: 8), in their research, showed that if participants partake in a task in a language which is not their native language, it reduces the vividness and/or accuracy of the ability of participants to visualise the image, and could potentially be a reason why people decide different options are better suited for the same type of situation, when they are asked about it in different languages. Those who are then asked to visualise stimuli in their native language appear to outperform those in their foreign language (Hayakawa & Keysar, 2018).

Previous research completed on visualisation tasks have recommended that future research should focus on whether results that have been found with foreign languages in visualisation tasks, could be reproduced with participants who come from other language backgrounds

(Hayakawa & Keysar, 2018) and, crucially, whether visualisation ability can predict decisions made in a non-native language. Native Mandarin and German speakers, who speak English as a foreign language, as well as native English speakers with Spanish as a foreign language, have been found to reproduce results where native speakers perform better in the visualisation task than foreign language speakers do.

It would be of interest then to see if this effect may be replicated in native language Afrikaans speakers with English as an L2. Although the groups presented in Hayakawa and Keysar's (2018) study proved to be quite heterogeneous in terms of language backgrounds, a group with Afrikaans as an L1, and English as an L2 (as opposed to a foreign language) could prove to add a fresh perspective to the previously discovered results.

### **1.3. Specific research questions**

The research questions are as follows:

1. Do individuals with prolonged exposure to, and use of, the L2 (in this case L1 Afrikaans – L2 English bilinguals) exhibit the same framing effect biases documented in previous research?
2. May language background variables, and L2 visualisation ability, account for the variation in the decisions made by this group?

As was mentioned in the previous section, the main focus of the current study concerns whether the different language conditions may or may not have an effect on the usual risk-taking and risk-aversion patterns of participants in previous research. The second question, which includes participants' abilities when visualizing different stimuli in different languages, focuses on possible explanations for the reason that different languages cause participants to make different choices, in (generally) the same situations.

Hayakawa and Keysar (2018) believed that speakers have an advantage when stimuli are presented in their native language, as they can form a clearer picture of the scenario at hand, and therefore make a better informed choice based on this ability to visualise. Due to language playing such a crucial role in this task, it would be important to try and ensure that any results obtained in such a study was not due to a lack of understanding, but rather that the participants

in each language group did vary in their performance when asked to do so in either their native or foreign language.

The current thesis thus aspires to make two original contributions. First, it extends the line of research on framing effect biases to L2 speakers with prolonged L2 experience and exposure. This will allow us to test the limits of the language effects with regards to framing, and moreover, the thesis does so in a context that is currently severely under-represented in research that deals with language effects on behaviour.

The second contribution concerns assessing the possibility that mental visualisation in a L2 may predict decisions made in that language, in that the participants lack of ability to visualise scenarios in an L2 might cause participants to choose differently to L1 speakers. This is not to say however, that the difference in visualisation is the sole cause for the reduced framing effect in the non-native condition, and determining whether these differences account for certain behaviours involves an entirely different matter.

#### **1.4. Methodology**

The present thesis assumes the same experimental paradigm as most previous studies on framing effects and language. In the main test used in the thesis, participants are presented with and will complete an adapted version (to the South African context) of the “Asian disease problem” (Tversky & Kahneman, 1981). An online survey (Psytoolkit) was used to collect the data for the thesis (which included the main risk-taking task, as well as the classification task).

The data elicited by this task will be used to determine whether framing in risk situations yields the same effect when it comes to choice making, in both a native and second language, as the effects that were carried by framing in previous research. The second test of the study participants will partake in constitutes a mental imagery task, similar to that used by Hayakawa & Keysar (2018), and was made use of to test potential differences in participant visualisation. The data to advise the study was collected by means of an online survey, randomly assigned to participants as presented in either Afrikaans or English.

## **1.5. Outline of the thesis**

In chapter two, an overview of the literature is provided, focusing on past research that have been conducted on the ways in which language can affect our decision-making, as well as on performance in classification tasks based on the different languages in which the tasks are undertaken. The chapter then continues to review the languages that have been found to carry an effect in which types of tasks in previous research (such as the trolley problem as a moral dilemma, as well as framing effects in risk scenarios), as well as what these different effects specifically entail. The roles of emotion and cognition when it comes to decision making are also discussed, and how they relate to the different choices that different languages induce. The chapter closes by reviewing the factors other than language which may possibly contribute to language effects in decision-making, and also raises some points of criticism on the literature of the research published to date in this field.

Chapter three presents the theoretical background of the thesis and starts off by explaining the notion of linguistic relativity, and how it applies to the strand of research on language effects. The specific dilemmas where framing effects have been found (such as the Asian disease problem, and the financial crisis problem) are then explained in detail. The chapter continues by presenting the theories that have been compiled in an attempt to explain why language effects happen, and also why they occur in the manner that they do across different types of scenarios. The chapter ends by providing a definition for the notions of second and foreign languages, which proves to be important for the current research as it focuses on the effects that a second language could potentially carry based on previous research which had been conducted on foreign languages.

In the fourth chapter, the methodology of the thesis is presented. This chapter includes a detailed description of which participants were recruited, as well as the background characteristics of the participants in the data pool. The chapter goes on to discuss any ethical issues which were met and overcome in the process of acquiring the necessary permissions to conduct the research, as advised by the MA research guideline. The methods and materials made use of (for both the main framing task, and the visualisation task) are discussed in this chapter, as well as the procedure followed by the participants when participating in the research. The chapter concludes by providing a detailed description of how the researcher will conduct the data analysis for both the framing test, as well as the classification test.



Chapter five contains the results of the tests conducted in the study. It provides the data captured for the framing task, as well as that captured for the classification task. It presents the results of all the different types of analyses conducted on the data as discussed in the fourth chapter. It focuses on analysing the tests based on their framing versions, as well as their language conditions. The results in this chapter also presents specific participant background information, such as age, sex, and language background variables.

A discussion of the results ensues in chapter six. The discussion starts by focusing on providing answers to the research questions which were presented in chapter one, based on the results from data analysis. The theories presented in the theoretical framework are discussed with regards to the results that were found in chapter five, and how these theories would possibly explain the results found in the current thesis. The results of the visualisation task will be discussed while focusing on its repercussions for the framing task. Finally, the chapter will end off with a discussion the notion of WEIRD (Henrich, Heine, & Norenzayan, 2010), and whether it may be applied to better understand the current results in relation to previous research.

Chapter seven completes the thesis with the conclusion, which will summarise the main points that have been made throughout the thesis in the different chapters, while also discussing the contribution that the research conducted in the thesis has made to research in the field of psycholinguistics (specifically research on language effects on decision making). This section will also discuss potential shortfalls of the current research project, and how these could be rectified in possible research in the future.

## **CHAPTER TWO:**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

In life, one of the most common activities for any person to partake in is making a decision. The decisions people make can either be minor, such as choosing what to make for supper, or they can be significant, such as choosing to leave one's home country to start a new life in another. Decisions can be made across all age groups, by both adults and infants, and decision-making is something that one never stops taking part in, up until the day they die.

Our decisions that we make are usually based on information that is communicated in some way to us, through language. A question one could ask then is should the language the information is presented in, carry any effects of its own on the decisions that are made? Unless the information provided by language is misunderstood (and because of this misunderstanding one chooses one action over another), the language in which the information is provided should not really carry any major effect on the decision that is made. In this case, the answer would be no: ideally, decisions should be made independently of the language they are being decided in. This however, is only the ideal, and not in fact the reality.

In our modern day and age, an increasing number of individuals regularly have to make decisions in different types of language contexts. Even with a task as simple as shopping, people may encounter many situations where they have to operate in, or be exposed to, a language other than their native or first language. This holds especially true for contexts that are rich in language diversity, such as the South African context. If decision making is said to be influenced by the language informing it, what effects could this possibly have on the decisions people make? And further, are these decisions based on the best possible choices that an individual can make?

Language will always be a powerful and effective tool that individuals make use of everyday to accomplish a variety of things. We use language constantly to (very importantly) interpret things in our surroundings, and to make decisions based on the information we gather through these interpretations.

In recent years, it has come to the attention of researchers that the language one speaks can have an influence on the way one perceives or interprets reality, and even shape the choices one makes based on these interpretations. The majority of studies on the role of language in decision-making have examined whether operating in a foreign language (a language learned in a classroom setting, in a context where the language is not used as a means of communication) leads to people making different choices in a given situation, compared to when they are operating in a native language (Corey, Hayakawa, Foucart, Aparici, Botella, Costa, & Keysar, 2017; Gawinkowska, Paradowski & Bilewicz, 2013; Caldwell-Harris & Ayçiğeci-Dinn, 2009; Christensen, Flexas, Calabrese, Gut & Gomilla, 2014; Costa, Foucart, Arnon, Aparici, & Apesteguia, Heafner, & Keysar, 2014b; etc.).

An example of a specific foreign language effect is presented in the footbridge dilemma (section 2.4, p. 15), in which an individual has to make a choice to save the life of five people by actively sacrificing that of one person. When participants are given and asked to perform the task in their foreign languages, they appear to make choices that are different to the choices made by those who are tested in their native languages (Costa et al., 2014b).

Recent research, however, has brought to light that some of the effects that a foreign language may have on decision making can also be carried through a second language. A second language refers to a language that is learned after a first language (in a classroom setting in most cases), but the context in which the language is learned still provides opportunities to be exposed to the language (Winkel, et al., 2016). In a South African context, an example of a second language to a native English speaker would be Afrikaans, and an example of a foreign language would be French. Studies have found that both foreign and second language(s) have an effect on decision making when it comes to determining when to take risks, and when to choose a safer option (Hayakawa, Lau, Holtzmann, Costa, & Keysar, 2019; Huang & Rau, 2018, Winkel, et al., 2016).

## **2.2 Foreign and second languages and their effects**

As stated before, research on language effects on decision-making have focused on native (or first) languages, and foreign and second languages. These languages have been shown to be tied to different types of responses or reasoning. Emotion, or the lack thereof, presents one of the factors that can alter the way intuition and deliberation interacts (Costa, Vives, & Corey,

2018). Foreign languages have been associated with more cold, cognitive types of reasoning, whereas native languages have been associated with warm, emotional reasoning (Costa et al., 2018). In these ways native and foreign languages can exert different effects on the choices individuals deem to be more or less acceptable when making decisions.

### **2.3 Differences in foreign and native languages**

An individual's native language is has typically been found to be filled with emotion, and their foreign language, or L2 is considered to be easier to use when speaking of emotionally stressful subjects, in that the language carries less emotion. Support for the idea of these languages carrying less emotion has been found in psychotherapy sessions where patients showed a preference for these sessions to be led in their L2, as sessions in their L2 resulted in the patient having emotional reactions that they found less intense than when they were conducted in their L1 (Gawinkowska et al., 2013).

#### **2.3.1 Taboo words and topics in an L2 or foreign language**

Patients in the above mentioned situations, find that the preference to speak about these topics in the L2, can be reversed if the topic of conversation is considered to be taboo in the L2. Taboo words are considered to be the most emotionally evocative stimuli of language (Harris, Ayçiçeği, & Gleason, 2003). Processing of taboo words is believed to activate the amygdala (which is responsible for our emotional processing and learning), and has been a focus in the studies of the workings of the brain's emotional systems (Harris et al., 2003).

Due to this taboo factor switching preference, Gawinkowska et al. (2013: 3) focused on the taboo act of swearing, and whether it would be easier for individuals to perform the act in their L1 or foreign language. Students who were Polish-English bilinguals ranging from ages 21-24 were tested in Poland. It was hypothesized that using explicit language (or swearing) should be easier to do in one's L2 or foreign language, as these languages provide a type of emotional and cognitive distancing from the act that is being performed, as swearing in a foreign language excuses individuals from their own limitations or norms imposed by society (Gawinkowska, 2013: 5). In other words, it distances us from the rules which help us determine whether our behaviour is appropriate or not.

A study done by MacKay et al. (2002) supports the idea that a first or native language carries a heavier emotional weight than a second or non-native language. Mackay and colleagues made use of taboo words in a Stroop task. In the task participants were shown different taboo words in different colours. The objective of the study was for the participants to name the colour of the words, and ignore the words themselves.

The results of the study showed that participants responded more slowly when they were naming colours displayed over taboo words than they did when naming colours displayed over neutral words. Harris et al. (2003) presumed that the interference in this Stroop task occurred because the extra anxiety brought on by the stigmatized words interfered with the individual's attention to naming the colours of the words. This connection of extra anxiety with taboo words was supported by the fact that the interference experienced for these words were much stronger than that experienced with the interference of neutral words.

These social norms and limitations associated with languages can also be tied to the culture with which a language is connected. Certain topics in certain cultures might be best left unspoken, and due to this norm these topics might become taboo in that language. Research has also found differences between how bilingual individuals speak of themselves in the different languages they speak (Caldwell-Harris & Ayçiçeği-Dinn, 2009). Ross, Xun, and Wilson (2002), found these types of differences in their study that involved Chinese-American bilinguals who were college students.

When participants were asked to complete self-report scales in English, they described themselves in individualistic terms, and had a self-enhancing bias (Caldwell-Harris & Ayçiçeği-Dinn, 2009). This connects with the idea that American English as a language is associated with a very individualistic culture. When the students were asked to complete the self-report in Chinese, they became more modest in their self-rating and described their self-concept in collectivistic terms (Caldwell-Harris & Ayçiçeği-Dinn, 2009). This connects with the idea that Chinese cultures, and therefore the language itself, is collectivistic in nature.

### **2.3.2 Lying in a second or foreign language**

When people are asked to make a decision, which involves emotion, in their foreign language, their skin conductance responses (or SCRs) are reduced. This means, the way their body reacts to what they are doing, is done less so (Costa et al., 2014b). Caldwell-Harris (2015: 214) quotes Nelson Mandela stating “if you talk to a man in a language he *understands*, that goes to his

*head*. If you talk to him in *his* language, that goes to his *heart*". The quote itself implies that even though an individual might understand a foreign (or second) language, this language carries little emotional content as it is attached to cognition, and acting with our heart and brain results in different bodily reactions.

As mentioned above, the way the body reacts to situations, or how it is aroused by these situations, can be affected by the reduced emotion that an individual feels when speaking in his/her L2. Caldwell-Harris and Ayçiçeği-Dinn, (2009) used electrodermal monitoring through SCRs to test people's bodily reactions to reading true and false statements aloud in either an L1 or foreign language condition, using L1 Turkish, L2 English speakers residing in Istanbul. Using SCRs appears to present a reliable method for testing skin responses, and since the body reacts when individuals perform taboo acts (such as lying) SCRs should be good at helping with lie detection.

Another method for detecting lies however, is the more commonly known method of polygraph testing. It has been said, however, that when conducting a polygraph test, one should be cautious as certain individuals cannot be accurately examined in polygraph sessions (Abrams, 1989). These individuals include children, people with amnesia, and psychopaths – as these individuals might have a different understanding of the act, and for this reason have different bodily reactions to it. Those suffering from psychiatric conditions, for example, anxiety disorders, can also not be accurately examined (Caldwell-Harris, & Ayçiçeği-Dinn, 2009). It could also therefore be understood how people suffering from an anxiety disorder could produce readings that are difficult to interpret, as their physiological responses would be different.

People who are being polygraphed in their second or foreign languages should also be considered as a group who might not be able to be examined accurately, and should possibly be added to this list. Lying in a foreign language requires a different amount of effort than lying in a native language, and these efforts are mentioned by Caldwell-Harris and Ayçiçeği-Dinn's (2009) which were reported by participants who were asked to evade the truth in their L2/foreign language.

The Turkish participants in the study relayed concerns about the juggling effort of being able to focus on speaking correctly in their L2, as well as to continuously deceive the interrogator, and for these reasons found it more difficult to lie in their L2 (Caldwell-Harris & Ayçiçeği-

Dinn, 2009). These participants reported that they preferred then to lie in their L1. There appears to be support for this preference in behaviour, as researchers claim that lying (in one's L1) activates more areas in the brain than truth-telling does (Kozel, Padgett, & George, 2004; Mohamed, Faro, Gordon, Platek, Ahmad, & Williams, 2006), which would then require more effort from the individual. Brain regions that facilitate deception include the orbitofrontal cortex and the amygdala (Caldwell-Harris, & Ayçiçeği-Dinn, 2009). The amygdala has also been seen to play a role in the facilitation of emotion, which is an important aspect of one's self to keep under control when trying to deceive another individual.

Bilingual speakers, who have a lower level of proficiency in their L2, also appear to use a larger number of areas in their brain when communicating in their L2 (Caldwell-Harris, & Ayçiçeği-Dinn, 2009). If lying in one's native language activates more areas in one's brain than telling the truth, and speaking one's L2 results in an increase of brain areas used, then it can only be concluded that lying in one's L2 would result in the largest amount of cognitive strain. This statement was supported by participant responses in a study done by Cheng and Broadhurst (2005) that focused on the detection of deception. In the study participants reported greater anxiety when trying to deceive the researchers in their L2, in that trying to control both their verbal and non-verbal behaviour proved to be a heavily straining task.

This anxiety has come to be known as the “double stressor of lying in a foreign language” (Caldwell-Harris, & Ayçiçeği-Dinn, 2009). The double stressor consists of firstly, monitoring the lie that is being produced (ensuring it corresponds correctly). Secondly, it deals with the demands of putting across the correct or intended message in a less proficient language. When looking back at participant footage, Broadhurst and colleagues found that indicators of deception were easier to spot when the participants were using their L2 (Caldwell-Harris, & Ayçiçeği-Dinn, 2009).

Other participants in Caldwell-Harris and Ayçiçeği-Dinn's (2009) study stated that they preferred to lie in their L2 as they felt less reactive to what they were saying due to the amount of distance from their emotions it provided. These findings will prove to play an especially important role in investigative situations where interrogation and lie detection influence the likelihood of criminal conviction, and present an area that should be given much attention. This is especially the case when those being accused are bi- or multilingual speakers.

Bi- and multilinguals who feel fewer emotions when using their L2, might experience less emotional involvement if they are interrogated in their L2 (Caldwell-Harris, & Ayçiçeği-Dinn, 2009). In these cases, the typical physiological reactions that can be expected by interrogators when detecting that individuals are lying, might not appear. Also, confessions and polygraph tests can be considered unreliable in these cases, as individuals may claim results were found due to misunderstanding (in that they did not understand what was asked of them).

### **2.3.3 Emotion and cognition in native and foreign languages**

In their study, Caldwell-Harris and Ayçiçeği-Dinn (2009) showed how skin conductance can be influenced by the proficiency of an individual in the language the test is conducted in. This finding supports the idea that languages that are non-native (such as second and foreign languages), have a greater emotional distance from individuals – as well as how this distance from emotion influences the individual. Using or hearing an L1, is more likely to have an emotional influence on a person than his/her foreign language, as an L1 is learned in a more natural environment (and not formal), which in turn allows for emotional connections to be established to the language.

The recall of words is another area of human behaviour that is understood to be influenced by emotionality (Harris, et al, 2003). Recalling of words refers to the ability to remember words that were presented beforehand in a task, and from this recollection, to be able to distinguish these words from other words that were not presented in the task. In this case, if emotionality is increased, the likelihood of remembering the word later in a task is also increased. Anooshian and Hertel (1994) examined people's ability to recall words that carry different emotional connotations in a first and second language. The study included L1 Spanish, L2 English speakers (fluent in both as they acquired the L2 between 8 – 12 years of age). These words were compared with the recall of neutral words as well.

Anooshian and colleagues (1994) predicted that emotion words presented in a second language would lack the emotional closeness needed for the recollection of these words, and would result in a decrease of the amount of words recalled. The results of the study showed that emotion words were recalled more accurately than neutral words when the task was completed in the L1, and that emotion and neutral words were recalled equally when the task was completed in the L2 (Harris et al., 2003). Emotionality therefore had an effect on recollection in the L1 as it increased the amount of emotion words recalled in this language.



As hypothesized by Keysar and Hayakawa (2012), another effect of L2 and foreign languages is that individuals who are using their foreign language, should not be as affected by decision biases. This entails that when scenarios are framed in ways to bring about a certain effect on the individual (as it would in their L1), the foreign language condition will not be influenced by the manipulation of the framing. This was discovered through “subjective ratings” as well as “electrodermal responses” (Keysar et al., 2012: 661). The foreign language was also found to reduce the negative feelings that accompany loss, while also increasing the acceptance of bets with positive expectancies (even if these bets were hypothetical or real). This effect will be further discussed (in section 2.7, p. 20) on the hot hand effect.

It has been noted that when participants read texts that are considered to be emotionally charged in their foreign language, the areas in their brain that usually are related to emotional processing (such as the amygdala) are activated less than they would be if the text was in their native language (Hsu, Jacobs, & Conrad, 2015). This brain structure has been shown to be important for decision-making contexts which involve gains and losses (De Martino, Kumaran, Seymour, & Dolan, 2006), as can be found in typical risk type scenarios.

Emotional differences between native and non-native languages appear to be more distinct when the non-native language is learned much later than the native language, and also when the proficiency in the non-native language is significantly lower (Caldwell-Harris, 2015: 216). According to the impressions of the majority of sequential bilingual speakers, the native language has special emotional qualities that a later acquired non-native language does not have (Degner, Doycheva, & Wentura, 2012).

Bilinguals typically report that this feeling of a loss of emotion is not the by-product of misunderstanding – as in they do not understand the meaning of the word, and therefore cannot feel it emotionally. In fact, the semantic meaning of emotional words in the speaker’s second language is perfectly clear to them, but despite knowing the meaning of these words, they do not feel the meaning of them (Pavlenko, 2005). Even highly proficient bilinguals report that they experience their L2 as emotionally distant compared to their native language (Degner et al., 2012).

## 2.4 Moral dilemmas and the trolley problem

A moral situation (or dilemma), refers to a conflictual, hypothetical scenario where an individual has to engage in decision-making and consider a certain amount of variables. The decision the individual chooses to make in this scenario illustrates what he/she believes to be correct and incorrect. In these scenarios, the individuals are presented with two (or more) pre-set options (in most cases both of these options could be deemed morally unacceptable). These individuals are only allowed to choose between the options presented to them. These options should provoke the individual to make his/her decision based on his/her character, ethics and or morals – in other words, how s/he believes is the most acceptable way to respond. These pre-set options are designed to produce some kind of moral/emotional conflict within the individual.

An individual's L1 or native language and L2 or foreign languages has been found to exert different types of influences on the option s/he deems to be more acceptable based on his/her own moral standings. A well-known moral dilemma, which stems from philosophy, where a language effect on choice has been found to occur is known as the trolley problem. The trolley problem is composed of two difference scenarios which are known as the switch and the footbridge dilemma.

The dilemmas in the problem go as follows:

In the switch dilemma a person has to imagine him/herself standing near a train track where a trolley is rapidly approaching five men. One other man is standing on another track. In this situation the person has to determine whether or not s/he would flip a switch that would divert the trolley to the other track with the one man on it, saving the other five men in the process. In the footbridge dilemma the person is standing on a footbridge above a train track and an out of control trolley is approaching five men. Next to him/her on the footbridge is a very large man who is big enough to stop the runaway trolley. S/he has to decide whether or not to push the large man off the footbridge, which in turn means sacrificing his life, in order to stop the trolley and save the lives of the five men. Language has been found to have an effect on participants' choices when individuals respond to the latter dilemma (the footbridge dilemma), and not the former (the switch dilemma).

When individuals respond to the both dilemmas in their L1, they are more likely to choose the option that evades any involvement, and choose the option where nature is allowed to take its

course. This is known as the “deontological response”, which states no matter the circumstance, it will never be appropriate to sacrifice the life of another individual, no matter what the outcome might be (Corey et al., 2017). A response like this would be considered to be the warmer, emotional response as the lives of those involved are taken into account by the individual.

When people who are questioned decide to choose the option where they interfere and save the five workmen, they would be choosing a “utilitarian response”, which allows for exceptions when it comes to the ‘no taking another life’ rule. Utilitarianism supports the idea that the means to achieve the outcome are inferior to the outcome itself. In this case, the decision is based on maximising happiness and is psychologically distanced from emotion (Corey et al., 2017: 2). One could understand how this dilemma could be considered as the colder response, as all lives are not considered equal. As a result, the utilitarian will perform the act that results in a greater amount of happiness, which means sacrificing the one man to save the five. Costa et al., (2014b) propose in that “using a foreign language” when presented with moral dilemmas, increases the likelihood of the individual making a utilitarian choice.

When individuals are perform the task in their L1, they are more likely to choose to not push the man off the bridge. The deontological choice (or morally acceptable choice) has therefore been associated with the L1. In the foreign language condition, individuals choose to sacrifice the one to save the five. As could be inferred then, the utilitarian choice (or morally unacceptable choice) has been associated with the latter. Geipel, Hadjichristidis and Surian (2015) tested students from the University of Trento, who had Italian as their native language, and German or English as their foreign language. The study resulted in the use of foreign language increasing the amount of utilitarian responses made in the footbridge dilemma of the trolley problem. These results were in accordance with what has been mentioned here, as well as with previous research.

## **2.5 The framing effect and its role in risk-taking**

Responses to scenarios can sometimes be influenced, not only by the type of language that is used (i.e., native or second/foreign), but even by the word choices made and used in a specific text, with a specific language. The way in which a situation is portrayed is referred to as its frame, and the way in which a situation is framed can sometimes cause individuals to judge the

same situation differently (Christensen et al., 2014). This kind of effect would occur by a presentation of the same outcome, but emphasizing different verbs.

An example of this would be an elderly woman who passed away in hospital after a long battle with sickness. When relating this story to other people, the child of the woman might say something like ‘her mother *died*’ instead of the more euphemistic option ‘her mother *was not saved*’. Here we can see that the effect on the listener might differ in that the first group would see the mother’s life as given up because she could no longer fight the sickness. The second group however, might believe that the mother lost her life because the doctors and other medical staff did not do anything to help her. Although the outcome in these situations remained the same (a woman lost her life), the judgements on the lead up to the outcome could be drastically different.

The ‘framing effect’ refers to a type of decision bias where individuals make different decisions in response to a certain scenario, and this decision difference depends on the way in which the scenario is presented (Costa, et al., 2014a; Keysar et al., 2012; Tversky & Kahneman, 1981, 1986). Although the scenarios presented to individuals might appear different, they are in actual fact identical in their outcomes. The reason for the apparent different is that the scenarios are framed differently – as either a loss or a gain frame (Huang, & Rau, 2018). When people are presented with scenarios such as these, they do not always make the most rational decisions, and instead can be influenced by the way the situation is framed, and also the language in which the situation is presented (Winskel et al., 2016).

Because of the framing factor, people’s decisions made in these scenarios, which actually share identical outcomes, are far from identical. As an example, if people are presented with a scenario which is framed in terms of gains, they are more likely to be risk-averse. Being risk-averse means that if one option is risky, and another option is safe or sure, the individual will avoid the risky option and choose the safe or sure one (Winskel et al., 2016). If the scenario is framed in terms of losses, however, individuals are more likely to be risk-seeking. In this instance they would prefer to choose the risky option instead of the safe/sure one.

One would, however, expect that if rational individuals are presented with scenarios that have the same outcome, the choices they make should have similar outcomes. This irregularity of choice was first discovered in the “Asian disease problem” (Kahneman, 2011; Tversky & Kahneman, 1981), which will be explained in detail in the theoretical framework (in section

2.9, p. 22). Interestingly, these effects of framing are found among both those who would be considered academics and lay-persons, and therefore cannot be assumed to be the result of a lack of knowledge in a certain field.

For example, choices by lay persons in a medical scenario would be similar to those with an actual medical background (both groups would be influenced by framing). Framing effects are not diminished either once individuals are given the opportunity to read both the gain version and loss version one after the other. They still turn out to be risk-seeking in the loss frame and risk-averse in the gain-frame, and are unaware that in both scenarios the outcomes are the same (Kahneman, 2011).

## **2.6 The influence of native and foreign languages on the framing effect**

Research in the area of framing effects have investigated whether these effects still occur when a scenario is presented in a foreign or second language (Keysar, Hayakawa, & An, 2012; Costa, et al., 2014a). When individuals are given the tasks in their native language, the usual framing effects were exhibited. These effects were diminished, however, when the scenarios were presented in the foreign language of the individuals. This shows that the language itself in which information is presented has an effect on the way individuals interpret risks, gains and losses (Costa, Vives, & Corey, 2018).

Winkel et al. (2016), found that L1 Thai, foreign language English students in Bangkok, who took part in research in their native language, were found to be more willing to take risks (risk-seeking) when the situation was framed in terms of losses than when they were framed in terms of gains (for which they were risk-averse). The framing of the situation therefore had an effect on the behaviour of the participants in their native language condition. These types of responses, however, were not found in the foreign language condition. In fact, framing effects appeared to be reduced in the foreign language condition as participants seem less risk-seeking in the loss frame of the versions (Li, & Xie, 2006).

The foreign language diminishes framing effects in that processing in a foreign language leads to a reduction of risk-seeking and sensitivity to loss. In a foreign language it would then seem that people are less affected by the way the problem is framed in that they are less sensitive to whether a choice is framed in terms of gains or losses. Due to this lack of sensitivity to framing,

people become less consistent with their choices, as it appears that they process the impact of good and bad outcomes equally (Costa, et al., 2018), and therefore choose options with good and bad outcomes equally (such as in the loss version).

Keysar et al. (2012) explained this foreign-language effect in terms of the greater emotional and cognitive distance found in the foreign language than the native language. The fact that the framing effect can lead to different emotional responses for scenarios which end in the same result, adds support to the conclusion that the framing effect has some type of connection to the amygdala, as the amygdala is a brain region commonly associated with emotional arousal (Harris et al., 2003). Foreign language contexts can therefore be considered to exert its own influence on the way one makes sense of events that one encounters in the world.

Huang and Rau (2018) aimed to test whether the effects that occur in a foreign language would also occur in a native language, as all of the studies where a reduction in framing effects occurred were with foreign language conditions. Chinese-English bilinguals in Beijing, with almost equal proficiencies in both the languages were selected and tested using the financial crisis problem (discussed in section 2.10, p. 24), instead of the Asian disease problem (Huang & Rau, 2018: 1).

The same effects were found with the bilinguals in this study as was found when testing foreign language participants with the disease problem in previous studies. Participants in their first language were risk-averse for gains and risk seeking for losses. This means that in the first representation, they would prefer to make the sure choice, and avoid the risk or gamble of the second choice. In the second representation, participants switched, preferring the gamble.

Interestingly though, these framing effects were also diminished when the scenarios were presented in the participants' L2 (Huang & Rau, 2018: 5). When tasked with making a choice for the scenario, participants choose equally between both options in the loss frame, unlike those in the native language condition who display a strong preference for the risky option in the loss frame. This would then mean that both second languages and foreign languages have something in common, and whatever this commonality may be, could be the reason for the diminishing of framing effects.

To reiterate, foreign languages diminished the effects of framing in the loss version, and framing itself can be considered as creating some sort of illusion of two different results when there is only one outcome. Foreign languages can then be said to reduce both perceptual

illusions (Kahneman, 2011), as well as illusory correlations (Costa et al., 2018). Perceptual illusions refer to illusions that come about when an individual is perceiving something (through either sight, hearing, thought etc.). Illusory correlations, in other words correlations that are perceived to be there but are not actually there, have been found in what is known as the “hot hand fallacy” (Gao, Zika, Rogers & Thierry, 2015).

## **2.7 The ‘hot-hand’ fallacy**

The ‘hot hand’ fallacy is the tendency for an individual to expect to receive a positive outcome, after encountering a series of positive outcomes beforehand (Gao et al., 2015). This fallacy occurs even though the positive outcomes are actually independent from one another, and creates a false sense of correlation.

A common example provided to explain this fallacy is the experience of being on a lucky streak when gambling. Even though gambles occur independent of one another, which therefore means each gamble’s outcome is independent, if one is experiencing a positive outcome each time (in this case, winning bets), there is a greater chance that the individual will believe that luck is on their side, and will continue to gamble and expect these positive outcomes. This behaviour is what is expected of people who gamble (and, parenthetically, certainly from the casinos they gamble in).

Accepting or waving bets for gambles falls under the domain of risk taking, as in certain situations there is no way to determine what the outcome of one’s gamble would be. In this case, taking the next bet would be considered risky or a gamble, and waving one would be considered the sure or safe option. Choosing to leave the gamble would be the safe option in that if one chooses to not bet, one cannot lose anything. The hot hand fallacy, however, has been found to be effected by emotionally marked language feedback in a foreign language, in that the expectance of positive outcomes in the future is diminished when the feedback is provided in a language other than the native tongue (Costa et al., 2018).

When people are provided with feedback in a foreign or L2, they are likely to play fewer gambles and, in addition, have slower responses when choosing to gamble or not. Gao et al. (2015) found this effect when conducting research in Wales using L1 Chinese, foreign language English speakers. Those who are given feedback in their native language, make

decisions that can be expected from hot hand effects, in that their choices are made at a quicker pace, and the gambles they choose to play result in larger gains and smaller losses (Gao et al., 2015). Using a foreign language in these cases reduces the fallacy effect brought on by the positive outcomes.

This provides yet another dimension to the way in which language and cognition may interact, and the effects that language may exert on decision-making (specifically decision-making under risk). For framing effects, foreign languages result in a reduction of loss aversion (which will be explained more at a later stage in the thesis in section 3.2.3, p. 42). With the hot hand fallacy, positive feedback provided in foreign languages resulted in a reduction of the hot hand effect (Gao et al., 2015). In both cases then, foreign languages caused a reduction of some kind.

## **2.8 Differences between second and foreign languages**

Research on the effects that language may carry on participant choices in different scenarios, have discussed the reasons why emotional resonance may differ between first and second languages (Durst, 2001; Dewaele & Regan, 2001; Dewaele & Pavlenko, 2002; Harris, et al., 2003). One of the reasons provided for the difference is that first and second languages are learned in different social contexts. An L1 is learned at home, from the individual's family. This context allows for the expression of emotion, and is usually the place where most individuals are exposed to all different types of emotion. It is also the place where individuals learn about socio-normative rules (in other words, what society deems as correct and incorrect), and where they experience punishment or discipline, from their parents or caregivers, for behaving in ways that deviate from these rules.

Second and foreign languages, however, are according to Harris et al. (2003) learned in an educational, classroom context, where people are expected to act and behave in certain ways. This environment can therefore be considered less emotional, and more academic. Bond and Lai (1986) felt that if second languages are learned in these contexts, then second languages would bring forward more controlled behaviour, and lessen any emotional arousal that could be brought about by exposure to the L2.

This difference in context would then explain the distance between non-native languages and emotion. This however, cannot always be the case as certain individuals learn their second



languages in more naturalistic ways. This is especially the case in areas where language diversity is rich, such as the South African context for example. One would then question whether the effect on behaviour, and the distancing from emotion would still occur in an L2 if the context in which it was learned differed to this extent.

Bond and Lai (1986) also suggested that in interview settings – due to this emotional distancing – bilingual people would be more comfortable discussing topics that might be embarrassing to them in their L2 (Harris et al., 2003). This effect was indeed found as participants were more comfortable discussing embarrassing topics in their L2, and actually even spoke about them at greater lengths (in comparison to neutral topics). This further supports the idea of emotional distancing, as psychiatric patients also preferred to discuss highly emotional topics in their L2.

Caldwell-Harris (2015) also puts forward possible causes for the emotional distancing, of which the following have been mentioned: proficiency, and the type of context in which the learning and use of the foreign language takes place. Caldwell-Harris (2015) also mentions the factor of the frequency of foreign language use. This would be how often an individual gets to practise using their foreign languages.

If they live in a context where the language is spoken, opportunities for using the language outside of the classroom context might present themselves. These three factors are connected as they influence both each other and the emotionality of the foreign language, as the frequency of use has an impact on an individual's proficiency itself. The less the language is spoken in the social context, the less proficient the individual would be in the language, which would lead them to feel less of an emotional attachment to the language.

## **2.9 The Asian disease problem**

Winsky et al. (2016) focused on risk-taking in a foreign language, and whether the way a situation was framed would have an effect on the choice a participant made. In the paper, it is mentioned that a framing effect was found in a study by Tversky & Kahneman (1981), during which participants were presented with the 'Asian disease problem'. In this scenario, participants are asked to select one of two programs to help with the treatment of a disease, and save lives in the process.

The scenario is then either framed positively or in terms of a gain as “lives saved”, or it is framed negatively or in terms of a loss as “lives lost”. Over the last two decades the problem has triggered many studies, specifically those which focus on framing effects (Li, & Xie, 2006). Participants in the gain scenario, are expected to choose the safer option, whereas those presented with the loss scenario, are expected to choose the risky option. This problem, when it is stated in what is known as the ‘gain frame’, was presented as follows:

*Imagine that the United States is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:*

- 1. If program A is adopted, 200 people will be **saved**.*
- 2. If program B is adopted, there is a one-third probability that 600 people will be **saved** and a two-thirds probability that no people will be **saved**.*

In this version of the problem, participants are presented with the scenario in terms of the amount of lives that would be saved (Tversky & Kahneman, 1981). The other frame in which the problem can be presented is known as the “loss frame” version of the problem, and is presented as follows:

*Imagine that the United States is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:*

- 1. If program A' is adopted, 400 people will **die**.*
- 2. If program B' is adopted, there is a one-third probability that nobody will **die** and a two-thirds probability that 600 people will **die**.*

Here, participants are presented with the scenario in terms of the amount of people that would die – or in terms of lives lost (Tversky & Kahneman, 1981).

Upon close inspection, one realizes that the consequences or outcomes of each of the first and second options are actually identical. Irrespective of choosing the first option in the gain frame,

and the first option in the loss frame, four-hundred people will die. In spite of this, individuals still prefer to choose the sure option in the gain frame, but they tend to reject the sure option in the loss frame (Kahneman, 2011). This means that they are risk-averse for gains, and risk-seeking for losses.

Kahneman (2011) suggests that one might infer that the difference in choice is a result of ignorance, in that participants who lack the necessary experience to make these kinds of choices in these kinds of scenarios might choose incorrectly. This, however, is not the case as Amos Tversky, during a speech to be given to public-health professionals, presented an audience with the Asian disease problem.

Half of the group was presented with the loss frame, and the other half the gain. Just like previously tested individuals, the health professionals were also susceptible to the framing effects, and displayed the same biases in the same scenarios. He then further states that the fact that professionals could be swayed by these biases was worrying, as they are constantly involved in work where they have to make decisions about people's health care (Kahneman, 2011).

## **2.10 The financial crisis problem**

The financial crisis problem is similar to that of the Asian disease problem, in that one has to make a choice (that is either framed in terms of gains or losses) to prevent one's company from losing a substantial amount of money. The difference then, is that instead of losing lives, the scenario deals with losing money. This would then seem to distance the individual from the scenario, as money presents an object over a life. However, the money lost in this scenario belongs to the individual who needs to make the decision. This would then bring some personal form back to the situation. (The currency in each scenario is adapted based on the exchange rate for the particular country).

The financial crisis problem, as presented by Huang and Rau (2018), goes as follows:

Recently, a serious financial crisis has started. Without any action, the company you manage will lose 6,000,000 MYR. To save this money, two types of actions are possible.

1. If you choose Action A, 2,000,000 MYR will be saved.

2. If you choose Action B, there is a 33.3% chance that 6,000,000 MYR will be saved and a 66.6% chance that no money will be saved.

Which action do you choose? Action A or Action B?

As was found in the Asian disease problem, the above would be the gain frame version of the problem. What follows would be the version that represents the loss frame of the problem.

Recently, a serious financial crisis has started. Without any action, the company you manage will lose 6,000,000 MYR. To save this money, two types of actions are possible.

1. If you choose Action A, 4,000,000 MYR will be lost.
2. If you choose Action B, there is a 33.3% chance that no money will be lost and a 66.6% chance that 6,000,000 MYR will be lost.

Which action do you choose? Action A or Action B?

The final crisis problem is known to carry the same framing effect as that which is found in the Asian disease problem. Participants are more likely to choose the gamble, or the risky option, once the money that they may lose is presented as a potential loss (instead of how it is presented when in the gain frame as what could be saved). As one problem deals with lives lost, and another with money lost, the reasoning for the framing having an effect on participants has to lie elsewhere than human lives or money lost – as these two factors differ significantly, irrespective of the results being similar.

## **2.11 Factors that may contribute to the foreign language effect**

Although it is apparent that foreign and second languages affect people's decision-making, consensus has not been reached on the underlying mechanisms of foreign-language effects. It cannot be pin-pointed whether the main influence of the effects are more emotively or cognitively oriented (Huang, & Rau, 2018), or even that the influence of the effect might be attributed to something else.

### **2.11.1 Language demands**

A factor that could potentially contribute to the foreign language effect has to do with the amount of language or text that might be found in the scenario presented to participants (Huang, & Rau, 2018). If the scenario is more language-laden it includes more sentences (and therefore words) which describe the scenario. This increase in word count could possibly lead to an increase in the likelihood and strength of a language effect, since it is the words represented in the language that carries an effect on the individual.

Participants would then need to grapple more with understanding information presented in their foreign language, and could in turn increase any possible language effects that may come to be (Huang, & Rau, 2018). Therefore, the more words there are in a scenario, the stronger the chances are of a second or foreign language effect (Hayakawa, et al., 2019). If a rich linguistic context is necessary for foreign language effects, scenarios that have very little linguistic input might cause the language effects on decision-making to be reduced. Scenarios with fewer words should then be researched in different ways to those with more words.

The foreign language itself might not contribute to the reduction effect, but rather the fact that there is not enough of it present to cause an effect. If scenarios are language-laden, participants with lower proficiencies in their foreign language might then struggle to understand the task, and the effects of language would once again be reduced (due to misunderstanding and not the foreign language). This leads to the next potential factor.

### **2.11.2 Proficiency and age of acquisition**

It will always be of importance to take individual proficiencies into account when people are taking part in anything that might involve the use or comprehension of a language. Language effects might not be due to emotional or cognitive ties, but rather the result of a lack of understanding. People who cannot make well-informed decisions cannot be considered to add to the pool of evidence for language effects on decision-making, as the choices they make might be the result of randomly choosing the option of which they understand or can recognise the most words.

Also, if proficiency in languages may contribute to effects found, what would proficiency levels mean for bi- and multilinguals who are equally proficient in the languages they speak? It has recently been found that participants who have higher levels of proficiency in their

foreign language(s) act or respond to situations in the same manner that a native speaker would (Huang, & Rau, 2018; Costa et al., 2014b). This is true for the case of the trolley problem in that people who had native-like proficiencies in their foreign language(s) chose the option usually expected in native language conditions (Corey et al., 2017).

Other research proposes that the emotional distancing that accommodates L2 use may corroborate with L2 proficiency, in that lower but not higher L2 proficiency would result in an emotional response that is reduced (Harris et al., 2006; Pavlenko, 2012; Degner et al., 2012). A higher proficiency in an L2 may promote more emotional grounding in the individual, which in turn could elicit emotional responses similar to that found with L1 speakers.

In a study conducted by Corey, et al. (2017), Spanish first language speakers were tested using the trolley problem. The tests were conducted using Spanish as the native language condition, and English as the foreign language condition (where English could either be the speaker's second, or third language after Spanish and Catalan). Individuals were also given a test where they had to complete a translation task out of ten, and those who scored above eight were categorised as high level speakers, whereas those who scored below eight were low level speakers (Corey, et al., 2017).

Corey and colleagues (2017) reported that a difference was found between the high level and low level group's choices. Those who formed part of the low level group made more deontological choices in the footbridge dilemma (eliciting colder responses from the participants). The high level group made choices similar to those of native speakers, where they felt it would not be wise to sacrifice the five workers for the one (Corey, et al., 2017). Research where the participants have almost equal proficiency and use in the languages tested have not been conducted as of yet, and should provide evidence which could either support or disprove the theory that those with a higher proficiency tend to act as native speakers would.

In the case of the framing effect, people with a higher proficiency in their foreign language might still be influenced by framing effects, and might not take risks (irrespective of whether the scenario is framed in terms of gains or losses). Those who are affected by the hot hand fallacy should then also continue to be prompted by positive feedback in their foreign language if their proficiency in the language is high enough.

Studies that correspond with these results would provide evidence that foreign-language effects are reduced at higher levels of fluency (Huang, & Rau, 2018). Surprisingly, studies that contain

scenarios with high language demands (in other words, those that contain a lot of text that needs to be read), still carry foreign language effects for people who have acquired similar proficiencies in different languages. Conversely, scenarios with limited or lower language demands exerted minor foreign-language influences (Huang, & Rau, 2018).

It is reasonable to predict that one of the reasons foreign-language effects may diminish or disappear when high proficiency in a second language has been acquired. However, research is yet to prove the exact reason(s) for the occurrence of foreign-language effects. It is still currently unknown, and all that can be done is for predictions to be made for other potential causes. Another factor that has been proposed to contribute to the presence and magnitude of foreign-language effects is how language can influence the way we visualise certain situations when determining which choice to make.

### **2.11.3 Visualisation in foreign and second languages**

Visualisation refers to the ability to mentally picture an event or situation that is not currently taking place. These could either be past or future events, or fictional or non-fictional (Hayakawa, & Keysar, 2018). If a person was asked to visualise his/her dream house, s/he would use past memories and experiences to help create the image of something s/he would wish to obtain in the future (Plailly, Delon-Martin, & Royet, 2012). In order to picture and transmit these visualisations to others, s/he would need to make use of his/her language.

One of the factors that can have an effect on the quality of the image we visualise is the “concreteness of the language” that is used (Paivio, Yuille, & Madigan, 1968). The concreteness of the language refers to what one is specifically being asked to picture. A concrete image would be that which one has physically experienced before, and has a physical reference with which to refer (such as picturing the shape of the window frame in one’s bedroom). If the language is less concrete, the image one would be asked to picture would be abstract. An abstract image would be for example, an emotion or type of feeling (Hayakawa, & Keysar, 2018). In this case, there is no physical reference, and for this reason it becomes difficult to picture the physical shape of being happy.

Another possible factor influencing visualisation could be the language that is made use of when doing so – in this case, the use of a foreign language (Hayakawa, & Keysar, 2018). Although it seems odd at first, one could simply consider the context in which a foreign language is learned, and a connection could possibly be made between foreign languages and

the difficulty to visualise items. Experience contributes a lot to our ability to visualise situations, and neuroimaging studies have proven this, in that an overlap has been found in the areas of the brain that are responsible for picturing both past and future events (Szpunar, Watson, & McDermott, 2007; Okuda et al., 2003).

Native languages are usually the languages in which we gain experience with our sensory memories, as these are the languages that we grow up with (Winkel, et al., 2016). Episodic memories, or long-term memories connected to personal experiences, have been found to be language-dependent in that they are more easily recalled when the language used to infer about the memory is the same as the language in which the memory was formed (Marian, & Neisser, 2000).

For example, if an individual is asked about what they did to celebrate a significant birthday, the answer they provide will be given faster and more easily if the language in which they have to answer the question matches the language in which they experienced that specific birthday. These memories would also be expected to be more detailed and emotional in the target language (Marian & Neisser, 2000, Matsumoto & Stanny, 2006). It would then be safe to assume that, in most cases, the language which would be tied to the most efficient recollection would be the native language of the individual.

In this case, if an individual is asked to recollect an event in their foreign language, they might not be able to do so as efficiently as they would if the language to which the sensory memory is attached is the native language. This could then have important implications for research focusing on language effects, as the reason for the occurrence of these effects might be due to a reduction of the ability to visualise (Hayakawa, & Keysar, 2018).

Foreign languages have been shown to affect “perceptions of risk, moral judgment, and self-control” (Hadjichristidis, et al., 2015; Costa et al., 2014b; Geipel, et al., 2015; Corey et al., 2017, etc.). With regards to the perception of risk, foreign languages have been known to diminish the effects that usually come about with certain types of framing. If one cannot properly visualise the outcomes of risky decisions, one could make choices without realizing the true consequences of a decision. This could be a possible reason as to why foreign languages diminish the framing effects that are usually found in the native language.

In moral judgement studies it has been suggested that a reduction in mental imagery could serve as an explanation for the reason people partake in more “utilitarian behaviour”, when



they are presented with scenarios in which they have to choose between saving five people and sacrificing one (see section 2.4, p. 15 on the trolley problem for more information). Utilitarian behaviour refers to the idea that the ends always outweigh the means.

In other words, if the end goal of a situation is to achieve the most happiness among individuals, losing the life of one individual would result in less sadness than losing the lives of five. In this case then, the only plausible option would be to sacrifice the one – as the only other outcome would not be able to achieve the end. The participants who make the utilitarian choice might not be able to picture the consequences (of the one life that is lost) in the same way those who participate in their native language might.

#### **2.11.4 Mental imagery tasks**

Visualisation could be considered as a potential cause for the differences in results when tasks are undertaken in a foreign language. In order to test this theory, Hayakawa and Keysar (2018) conducted a study where participants were presented with a mental imagery task that was based on a paradigm introduced by Mehta, Newcombe, and De Haan (1992). In the study, participants are presented with three different stimuli, and are instructed to select the one that is least like the other two based on a specific attribution. All other attributes of these stimuli would then have to be ignored. The attributes focused on in the study was that of shape and categorisation (Hayakawa, & Keysar, 2018).

Participants were, for example, presented with word tasks where three blocks in which words like ‘carrot, mushroom, pen’ were displayed (Hayakawa & Keysar, 2018: 11). The participants would be asked in some of the tasks to select the odd block based on either shape or category – and would have to ignore all other characteristics of the objects, such as their texture and colour. If the participant was asked to select the odd item based on shape, the correct answer then would be the mushroom, as carrots and pens share an elongated shape. If participants were asked to select the item based on category, the correct answer would be pen, as mushrooms and carrots belong to the vegetable category, of which a pen does not form part.

In order to arrive at these answers, especially ones for the shape attribute, participants would have to visualise the item, and only then can they make their choice (Hayakawa, & Keysar, 2018). Therefore, it can be assumed that those who perform well on this task by making the most accurate choices, would be those who could mentally visualise the items most clearly. If

using a foreign language results in a limited visualisation ability, those who perform the task in their foreign language should perform worse than those in their native language.

Although word tasks would be more preferable in such research, as the participant would have to visualise the object in the block in order to complete the task correctly, there could be one flaw with only doing such tasks. If participants are completing the task in their foreign language, but are not very proficient in their foreign language, they might not understand what they are reading, and the choices that they make might be inaccurate because of this misunderstanding, and not because the foreign language lead to a picture that was not as clear as one in a native language (Hayakawa, & Keysar, 2018). Hayakawa and Keysar (2018) controlled for such effects, by having participants perform the same type of classification task, but with images of the objects instead of words. Therefore, any misunderstanding that came about because of reading would be dealt with. This task would then require participants to have the same level of knowledge for the task, but without the visualisation (Hayakawa, & Keysar, 2018). One could also add that the category attribute would not require any visualisation, but rather world knowledge about items.

What Hayakawa and Keysar (2018) found was that participants who were tested in their foreign language were less successful or accurate in determining which of the blocks were odd when it came to the shape attribution task. If visualisation is weaker in a foreign or second language, it could explain why participants make different choices when they are questioned in their foreign language, as the vividness of imagery could contribute to decision making (especially in research focused on choice making in moral dilemmas or situations). Having a clearer image in mind could lead people to make better-informed decisions.

### **2.11.5 Stylistic factors and their influence**

Four conceptual factors to focus on when deciding on how to present scenarios to participants, mentioned by Christensen et al. (2014), are benefit recipient, personal force, evitability of outcome and intentionality (see the Geipel, et al., 2015 for examples as these factors apply well to the layout of the trolley problem). All of these factors could potentially present some type of contribution to the way in which individuals make decisions in hypothetical scenarios, instead of language carrying the effect alone.

Benefit recipient refers to who ends up gaining an advantage with the chosen outcome. In real life situations, most people would choose an option that benefits them over another person. In

the case of the risk scenarios, if an individual is told that they have to choose between saving five individuals by sacrificing one, but they were also informed that they are a part of those five individuals, the only way in which the outcome would benefit them would be for the one individual to be sacrificed. With risk scenarios, if they are informed that they form part of the 200 individuals that will be saved if they choose option A, the other option becomes futile in that it would not directly benefit the individual making the decision. It is best in this case to then try to keep scenarios presented to participants as vague as possible, as small details – such as the ones just spoken of – could cause participants to choose one option over another.

Personal force involves the individual having performing an action themselves which directly brings about the result of the option. Impersonal dilemmas refer to the individual starting a process which involves a number of factors that ultimately result in the chosen option, and adds some distance between the individual and the outcome (Christensen et al., 2014: 4). In the well-known Asian disease problem, the acting person is at a distance from the situation they find themselves in. Personal force should therefore have no effect on the outcome that participants choose, as in both cases no one is physically doing anything to contribute to the outcome (unlike in the switch dilemma which provides an example of an impersonal dilemma, whereas the footbridge dilemma exemplifies an action that involves personal force).

The last two criteria are the evitability of the outcome, and the intentionality behind the action. Christensen et al. (2014) explain that evitability refers to whether or not the outcome of the situation was inevitable. Intentionality links with evitability as it refers to whether the outcome of the scenario is what is wanted (intentional harm), or if it happens as a by-product of a series of events (accidental harm) (Christensen et al., 2014: 4). In the case of risk taking scenarios that have been used in past research, the outcome of both choices are always inevitable and intentional.

People are only given a few different options as choices for the outcome of the scenario, and even if they choose to not make a choice, a third outcome linked to not doing anything is also presented to them. This means that when people choose to not do anything, they are still making an intentional choice to not intervene. For example, individuals will be told that their company is suffering from financial problems, and that a large amount of money will be lost if they do not do anything to intervene (Costa et al., 2014a). One of the choices presented to them will be either a sure gain (as in keeping 20% of the money that would be lost), or taking a gamble and

potentially losing all of their money (a 66.6% chance), or keeping all of it (a 33.3% chance). The outcome of losing some money will always then be inevitable, even if no choice is made.

## **2.12 Critiques on previous literature**

The definition of what constitutes a foreign language has been given little attention. This appears to be the case even though some type of distinction between native and foreign language needs to be central to research in this area, as these two language groups are often at the core of the research conducted. To repeat what was mentioned before, foreign languages are typically learned and spoken in a classroom setting, and most interactions with this language are encountered in the classroom setting (Winskel, et al., 2016). This is normally the case because the context in which the individual finds him/herself in, does not allow for much social interaction outside of this setting.

Considering this foreign language definition, it becomes critical to note in previous research on the foreign language effect, the distinction of what makes a language a foreign language was not always adhered to. Participants in some studies were still considered to be eligible after having spent ten months living in the country of the target foreign language (Hayakawa & Keysar, 2018, Costa et al., 2014b,). In the majority of the studies conducted in this area, similar kinds of cut-off periods could be found. The cut-off period also appears to be arbitrary and not really supported by any empirical evidence, in that each study decides on its own time period which it deems appropriate for participation requirements.

For example, Winskel et al., (2016) decided to exclude participants who had been in the country of the foreign language for longer than ten months. Whereas a test conducted by Corey et al., (2017), declared that any speaker who had lived in the foreign language country for more than twelve months would be excluded. As mentioned in the above definition, foreign languages are learned and spoken in a classroom setting. The language of the participants (although spending less than ten months in the country) is no longer appropriately defined as a foreign language, as contact with the language could have occurred outside the classroom context.

A critique that appears to be rather important for this thesis, has to do with the language contexts in which the studies have been conducted in thus far, as well as a majority of the languages that have been focused on. Western Educated Industrialised Rich Democratic (or

WEIRD), put forward by Henrich et al., (2010), comprises a dominant body of research that has been conducted across language disciplines, as well as psychological disciplines (both of which contribute to psycholinguistics). Behavioural scientists tend to make general claims about human behaviour in these disciplines, when the results where their research comes from, are from these WEIRD contexts.

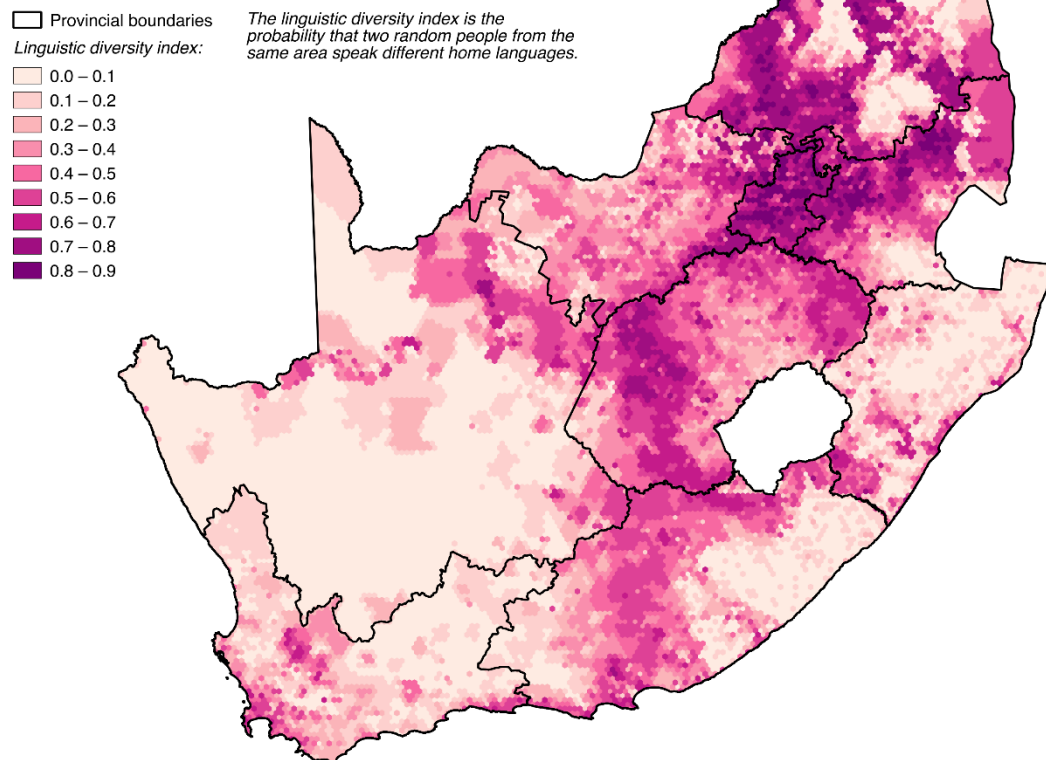
The results found in these studies be heavily influenced by the context in which the research is conducted, and for this reason could be limited to the WEIRD context, and not be generalizable. The language combinations of the participants in these studies are mostly European languages (such as speakers who have German as their native language, and English as their second language). The current study aims to shift this focus somewhat, to a South African context, where a South African language (Afrikaans) would form part of the research.

Although the second language can also be viewed as a European language (English), it falls under South African English, which differs from the English used in the previously researched contexts. It would therefore be beneficial to research in this field for a study to be conducted in a South African context, as the context provides people who have language backgrounds that are rich in diversity. The results of such research could contribute something new to the current findings.

While the South African context hosts 11 official languages, English continues to be dominant, especially in the areas of politics, business and schooling (Posel & Zeller, 2016). Due to the language dominance in these areas, English is seen as a language of empowerment, as individuals who wish to excel in these fields (and therefore life in general) need to have to have a good grasp of the language in order to advance themselves. This in turn results in the use of English being brought into the social and domestic contexts, as increased use leads to an increased grasp, and therefore a further advancement in life. In light of these circumstances, rates of bilingualism in the country have increased, where 35% of adults in their mid-twenties have English as their second language (Posel & Zeller, 2016).

The image below, in Figure 1, represents a linguistic diversity index map of South Africa, created by Adrian Frith in 2017, based on data collected from Consensus in 2011. The index represents the likelihood that two speakers picked at random, would have a different mother tongue, or would have different first languages. Following the key, those who are rated lower (and appear in a lighter shade), are more likely to speak the same mother tongue.

## Linguistic diversity in South Africa



Drawn by Adrian Frith (<https://adrianfrith.com>) from Census 2011 data by Stats SA (<http://www.statssa.gov.za/>).

*Figure 1: An image displaying a linguistic diversity index for the South African region.*

In most areas in the South African context which are densely populated, the chances are very high that two speakers will have different mother tongues (as is indicated on the map by the many darker shaded areas). The area in which the current study takes place (the Western Cape), appears to fall between a 0.5-0.7 rating, which indicates that the likelihood in this area, of two persons having differing mother tongues, is quite high.

This means that during social interactions in this context, it is very likely that speakers who do not speak the same L1 will interact with each other. For example, an L1 speaker of Afrikaans might interact with an L1 speaker of English in English, or vice versa. These types of social interactions are very unique to the South African context, and would be unlikely to be found in other linguistic contexts (and differ from those where speakers interact in formal settings using a lingua franca). Seeing as 35% of adults in their mid-twenties have English as their second language (Posel & Zeller, 2016), this likelihood of an English interaction increases.

Previous research has not been conducted in a country with as many official languages, where the speakers appear to be so linguistically diverse, and where the distinction between first and second languages could easily become blurred (as in the case with simultaneous bilinguals). It

is also a norm in the South African context for high power, political decisions to be made in languages that are not the native or mother tongue of the decider, which is also mentioned by Posel and Zeller (2016) when addressing the dominance of the English language in the political and academic fields. Some speakers involved in these decision-making processes may even have English as their third language, which could lead to an even more impactful effect. If an effect does exist, it would be of interest to see how this effect could potentially influence these high power decisions, in either a negative or a positive direction.

## **CHAPTER THREE:**

### **THEORETICAL BACKGROUND**

#### **3.1. Introduction**

The idea that language may have an effect on real world interpretations (and thoughts) can be tied into the notion of linguistic relativity. Linguistic relativity, which is most commonly associated with the work by Benjamin Lee Whorf (Bylund & Dick, 2019), states that people view and interpret the world differently because of the different languages that they speak (Levelt, 2014). Whorf noticed these differences between the American-Indian language Hopi, and so-called Standard Average European (SAE) - comprised of languages such as French and English (Levelt, 2014).

An example of a difference he noticed was that time was spoken of differently in Hopi compared to SAE. Instead of speaking of time as separate, countable slots, Hopi speakers only conceptualize the idea of the time moving on in the day, in other words, that it is getting later. This also ties in to the fact that Hopi does not have a “count distinction”, and therefore could not pluralise things in the same way the speakers of SAE could (Levelt, 2014: 491). It is for this reason that he concluded the speakers of the Hopi language would conceptualise time differently to those of SAE.

Recent research on the effects of language on thought has focused on individuals who speak more than one language, unlike the Hopi speakers did. As mentioned previously, researchers look for ways in which a foreign or second language may cause differences in behaviour or decision making, during certain tasks. The focus of current research is also on the effect of language in general on the behaviour and choices that participants make, and not necessarily the differences between languages and how this effects individual perceptions – as was the case with Whorf.

Foreign languages have been found to have an effect on the way people perceive risk, their ability to visualise, how they judge different moral situations, people’s self-control and the way they make sense of things they encounter in life – such as whether they believe certain events to be correlated or not (Hayakawa & Keysar, 2018; Costa et al., 2017). For this line of



research it would be of importance to focus on explaining how language may have an effect on visualisation and risk perception, and how this may contribute to decision-making.

### **3.2. Possible explanations for language effects in risk taking**

Certain theories have been put forward in order to attempt to explain why the foreign and second languages exert the type of influence that they do on framing effects. Of these theories, the following will be discussed and include: the dual process of reasoning and thinking (Kahneman, 2003), indiscriminant & strategic risk-taking account (Hayakawa et al. 2017), prospect theory (Kahneman & Tversky, 1979, 1982), equate-to-differentiate theory (Li, 2003, 2004), and the fuzzy-trace theory (Reyna, & Brainerd, 1995).

#### **3.2.1 Dual process of reasoning and thinking**

Dual process theories originally stem from theories posited in psychology, and appears to describe processes that are involved in every day decision-making (Frankish, 2010). Theorists who support dual-processing claim that there are two distinct processing modes that people have to make use of when making decisions. These processes are constantly at play and do not always lead us to the same decision, instead they might just lead the individual to favour different choices (Costa et al., 2018).

One of these modes is described as more “analytic, rule-based, deliberative and systematic”, whereas the other is considered to be “emotional, affective and automatic” (Huang, & Rau, 2018: 2). To word it simply, in a case where an individual decided to go with their gut feeling, they would be considered to be using the latter mode. If they decided to slow down and think through something, they would be using the former. The mode which is considered to be fast and unconscious has been referred to as System 1, and the slower, non-conscious mode as System 2 (Stanovich, & West, 2000).

Using these terms refers to the order in which we usually use these modes when making decisions – it is usually only once a task becomes difficult that we use System 2, thereby naming the mode in the order that it follows. Also, System 2 has been thought of as a mode that has come about due to human evolution, in that it represents qualities that are uniquely human – distinguishing humans from other animals (Frankish, 2010). System 1’s processes are

more related to behaviours found in animals, as it is automatic and unconscious, designed to promote genetic goals such as reproduction – and not guided by abstract thinking and logic.

One of the most well-known, and also earliest, ideas of there being an unconscious part of the mind was brought forth by Sigmund Freud. Freud himself believed that the mind was composed of a conscious and unconscious system (Frankish, 2010). Instead of interacting in the way that has just been explained, the systems that Freud proposed did not interact with one another. They were in fact a source of mental conflict, in that the unconscious seeks only to maximise the pleasure the individual experienced and minimise pain (Freud, 1963). The unconscious could also only access and influence individuals in indirect ways, through dreams for example, unlike the unconscious in the dual-systems theory that can have a direct influence on our thought processes (Frankish, 2010).

In the field of judgement and decision-making, Systems 1 and 2 play slightly different roles. As Frankish (2010) explains it, when making decisions, System 1 acts as more of an assistant to judgements and decisions. By this, he means that System 1 provides “default judgements”, or judgements that fit the general frame of the expected answer. These defaults are then passed on to System 2, which acts to supervise System 1. In most cases, System 2 will accept the quick judgement provided by System 1. Sometimes, however, System 2 will feel the judgement is not adequate enough, and will override what System 1 has provided. One can then ask the question – how does decision-making in a foreign language interact with the dual-process systems?

Based on the job descriptions of these two systems, one would expect that when a task becomes more difficult, System 2 should kick in and take control. A study conducted by Alter, Oppenheimer, Epley, and Eyre (2007) seems to provide grounding for this. Alter and colleagues found that by simply changing the font of the text participants had to read when answering questions (by making the font lighter in colour, smaller and *italicising* it), resulted in participants answered more questions correctly than those who were given the same text in a normal font. This would then suggest that those who had experienced more difficulty when reading the task, prompted System 2 to kick in and had the answers provided by System 1 overridden by their System 2. These participants then thought more logically when answering the questions (Winsky et al., 2016). Those who had the normal text presented to them might have found the task easier, and therefore only engaged with System 1 when answering.

Activities such as speaking, listening, reading and writing (which people gain complete fluency in, in their native language), can become more cognitively challenging when they are being performed in a foreign or second language (Costa et al., 2018). When something becomes difficult to process, it can be interpreted as a sign to engage in more deliberate thinking instead of intuitive thinking. So tasks that are more cognitively costly to process, prompt deliberation and are less influenced by intuitive reasoning.

Based on what was stated in the introduction, deontological choices are “associated with empathic concern”, whereas utilitarian choices are “associated with cognitive control” (Corey et al., 2017: 3). These differences in responses compose what is known as the foreign language effect with regards to reasoning in moral dilemmas. This could then explain the difference found in framing effect studies when participants perform tasks in their foreign language.

These participants might find the task more cognitively demanding due to reading it in their foreign or second language, and cause a shift to their System 2 (Costa et al., 2014). Because of this shift, these participants then undertake more logical thinking and reasoning. Once under System 2, participants are not as effected by framing, and therefore choose equally between options 1 and 2 in the loss version of the Asian disease problem. Those who then participated in their native language might have found the task easier, and therefore only engaged with their System 1, and were, in other words, more easily influenced by the framing effects of the problem.

### **3.2.2 Indiscriminant and strategic risk-taking account**

The indiscriminant risk-taking account predicts that, whether or not risk-taking would be more beneficial to the individual, they would be more likely to choose the riskier option in a scenario (Hayakawa, et al., 2019). Choosing to take more risks in this manner could be the result of either a decrease in the perception of risk, or an increase in impulsive behaviour.

In the instance where it could cause an increase in impulsive behaviour, foreign languages have been said to distance individuals from their morals. It could therefore lead to an increase in impulsive-like behaviour as it psychologically distances individuals from their inhibitions that cause them to be risk-averse in general life situations (Hayakawa et al., 2019). Instead of avoiding risk when it seems to be the most beneficial action, people might take more risks regardless. If someone were to focus on foreign languages potentially decreasing the perception of risk, s/he might partake in a risky course of action because s/he perceives the level of risk to

be lower than it actually is. This implies then that foreign language causes errors in judgements in risky scenarios.

A reason for this decrease in risk-value perception could be that when individuals are using their foreign language, they are taking on a heavier cognitive load than they would when they are using their native language (Hayakawa et al., 2019). This extra load could then reduce the availability of thought that might be put towards discriminating between a risk that is higher and a risk that is lower. In this case then, individuals who have a lower proficiency with the foreign language will find tasks even more challenging than those who have higher proficiencies, and might make more reckless or risky decisions because of this.

This could then offer an explanation as to why in moral problems like the trolley dilemma, individuals who have higher proficiencies in their foreign language display the same choice patterns as native speakers. Whether it be due to a decrease in risk-perception or cognitive ability, or an increase in impulsive behaviour, using a foreign language would result in more risk-taking, irrespective of if it is beneficial to do so (Hayakawa et al., 2019).

The strategic risk-taking account assumes that individuals take more risks because foreign languages allow them to take part in more calculated risk-taking, and not be influenced by the emotions they may normally experience when making decisions in their native language (Hayakawa et al., 2019). For example, if an individual is reading a task about the loss of life in his/her native language, his/her emotions may sway him/her to make the safer option – even though it might not be the more beneficial option. As foreign languages distance us from our emotions, they allow for clearer thinking in these cases, and cause us to choose the riskier option as (even though it might not be framed that way) it is the more beneficial of the two. People are then said to be less affected by the fear of taking risks (Hayakawa et al., 2019).

In the case of gains, they also might be less influenced by the ease of mind and comfort that is provided by the sure option in these circumstances – as these feelings would be influenced by their emotions. This would then also lead to participants to take more risks than they would in their native language. The difference between this account and the indiscriminant risk-taking account, is that individuals operating in their foreign language will only choose the risk when they feel that it is more strategic to do so. Therefore, more risks will only be taken when they are beneficial to the individual, but fewer risks will be taken when they are interpreted as less beneficial than the safer option (Hayakawa et al., 2019).

### **3.2.3 Prospect theory**

Prospect theory, created by Tversky and Kahneman (1979, 1992), is seen to be one of the main theoretical frameworks that provides an explanation for the occurrence of framing effects. According to prospect theory, individuals are a lot more sensitive to losses than they are to gains (Kahneman, 2011). This sensitivity leads to something known as “loss aversion”, which refers to the tendency to avoid losses instead of acquiring gains (Huang, & Rau, 2018: 6). In this case, the negative impact that might accompany a potential loss weighs on an individual more than the positive impact that might accompany an almost equal potential gain.

For example, if someone was offered the chance to either win R150 if a coin landed on heads, or lose R100 if a coin landed on tails, they are more likely to reject to partake in the gamble at all. Even though the amount that they stand a chance to win is greater than what they stand to lose, they would still not choose to take the risk (Kahneman, 2011). The reason for this is that the fear of losing money weighs more on the decision-making process than the hope of gaining some – for this reason, losses weigh more than gains, and more people are loss averse.

In order for this loss aversion to be diminished or removed completely, individuals need to stand a chance to gain twice as much money as they could potentially lose. Tom, Fox, Trepel, and Poldrack (2007) state that only in this scenario would the gains outweigh the loss, as the impact of a loss weighs roughly twice as much as that of a gain.

When adapting this to the Asian disease problem, individuals need to believe that choosing the riskier option would result in double the amount of lives saved than those lost. In the gain frame, then, fear induces participants to make the sure choice, in that they will avoid any disappointment they might face when taking a gamble. Foreign languages, once again, appear to distance people from their emotion, and because of this lack of emotion, people can overcome the fear of any disappointment, and choose as they please in the loss version. Foreign languages can be said to reduce the influence of loss aversion on the participants.

### **3.2.4 Equate-to-differentiate theory**

Equate-to-differentiate theory can be considered to be a “weak dominance” approach in that choices made in risk scenarios are based on these two factors of weak and dominant (Li, & Xie, 2006: 130). People taking part in decision making have to decide which of the presented options would be considered as weak, and which would be considered as dominant. This theory

holds that human decision-making in risky scenarios is not due to the fear of loss and risk avoidance, but rather a simple determination of which choice is more dominant than the other. Li and Xie (2006) when describing weak dominance state that if two options exist, for example alternatives A and B, and if alternative A is at least as good as alternative B in most aspects, but actually better than alternative B in at least one aspect, then alternative A dominates over alternative B. In this case then, alternative B is not even a choice to be considered further, and the best alternative is the dominant A.

With regards to framing effects then, participants might be driven to make the riskier choice in the loss frame due to the differences in the possible outcomes/choices provided for the scenario (Li, & Xie, 2006). If in the gain condition the differences between the lives saved in each option provided are not large enough, the riskier choice could dominate over the sure choice, and become the preferred option for this frame. Responding in a foreign language might reduce the effects of the frame and in turn remove the weak dominance bias.

For example, if participants in the Asian disease problem were told that the first or sure option only guaranteed that 20 lives would be saved, they might take the risk and gamble on the chance to save 600 people instead. This is because the difference between the certain outcome (20 lives) and the null outcome (nobody) are very small, compared to saving 200 for sure and risking saving no one. The same can be said for the loss frame (where 580 people would be killed), if the amount of lives lost are presented as a value close to the amount of lives gambled, the sure option dominates over the risk and becomes the better choice.

Li (1998) presented options using these numbers to their participants. The changes in numbers resulted in the difference between the sure option and the null option becoming smaller in the gain frame, whereas the difference between the two in the loss frame appeared to be greater. This led to a result that was different to the one found in the original Asian disease problem, in that individuals remained to be risk-seeking in the loss frame, but became risk-seeking in the gain frame too. This would mean that the difference in numbers perceived between the two outcomes plays a large role for framing effects.

### **3.2.5 Fuzzy-trace theory**

The fuzzy-trace theory is a type of dual-process approach, and shares some of the features that standard dual-processing approaches have. The theory focuses on distinguishing between gist-based reasoning, and verbatim-based reasoning (Reyna, & Brainerd, 2011). In standard dual-

processing theories, a distinction is made between intuitive processing (operates quickly, automatically and unconsciously), which can be compared to gist-based reasoning, and analytic processing (more rule-based, systematic and conscious), which can be compared to verbatim-based reasoning.

When picturing the layout of a room for example, if a person was given a picture that is out of focus, or appears fuzzy, s/he will be able to provide information on the gist of the room – such as whether there is a bed, desk etc. A picture in focus would allow him/her to provide more information. But if the point of exercise is to answer whether or not a bed exists in the picture of the room, with either the in focus or out of focus picture, s/he should be able to provide the correct answer. This is what fuzzy-trace theory deals with. Fuzzy trace theory also pays attention to the effects that emotion might have on the way people reason, and emotional aspects are tied to gist-based reasoning, as it plays an important role here. This proves to be another similarity between the two theories.

Gist-based reasoning is said to be imprecise, but catches the overall or essential meaning of an experience. In other words, it captures the bottom-line meaning, and is qualitative in nature. Gist-based reasoning would be identified as the out of focus picture spoken of earlier in the example. Verbatim-based reasoning is more precise on the other hand, but also superficial (Frankish, 2010). This would compare to the in-focus picture.

Gist-based reasoning is considered to be superficial in that it captures the exact surface form of a specific problem (it is precise), and is quite literal in its interpretation and quantitative in nature (Reyna, & Brainerd, 2011). A difference between fuzzy-trace theory and the dual-processing theory, is that the former theory places gist-based reasoning as the more important and most used form of reasoning (making it more central to the theory). And hence why it is referred to as fuzzy, because the gist-based reasoning /out of focus picture lies at the centre of this theory.

Fuzzy-trace theory states that individuals make decisions based on the lowest level of precision, and do not actually need a highly detailed analyses of the problem to do so (Li, & Xie, 2006). An example is provided of people who are highly trained in their respective fields, such as a heart surgeon or expert cardiologist, who would make decisions on whether or not an emergency operation needs to be done faster than students who are still training (Frankish,



2010). These experts then require less information to make their decisions, and therefore rely on their gist-based reasoning more than they rely on their verbatim knowledge.

It must be noted that gist-based reasoning in fuzzy-trace theory is more like insightful intuition based on vague, gist representations, and not the impulsive, mindless intuition that is compared to animal instinct in other theories, such as System 1 (Reyna, & Brainerd, 2011). The theory, however, acknowledges that there are levels of intuition that represent primitive forms of thinking, and there are levels that represent a higher kind and more insightful way of thinking.

Relating fuzzy-trace theory to the Asian disease problem, Reyna & Brainerd (1995) decided to test whether the numbers presented to people in the Asian disease problem were necessary in order for any framing effects to occur. In order to test this, Reyna & Brainerd (1995) presented the participants with an edited version of the problem where the numbers were replaced with vague, gist amounts. This would remove a bit of detail from the information presented in the task – making it less systematic and more intuitive.

For example, instead of saying 200 people would be saved, the option only stated that ‘some’ people would be saved. If numbers are to play an integral role in framing effects, it would be expected that framing effects would be eliminated if they were replaced with these vague amounts. According to prospect theory especially, the effects should disappear as it is the fear of the loss in the number of lives that overpowers the hope of the gain. If all numbers are removed, individuals do not actually know how much they would be losing.

Irrespective of the absence of numbers in the problem, framing effects were not only detected, but were actually larger in magnitude than when the numbers were present (Li, & Xie, 2006). 90% of the participants chose the sure option in the gain frame, and 86% of them chose the gamble in the loss frame (Reyna, & Brainerd, 2011). It would appear likely then that the presence of numerical information in the problem might mask the full impact of the framing effect in these scenarios. This uncertainty itself, however, could cause even more anxiety than knowing an exact amount, and could push individuals to be desperate in their attempts to make the best decision, providing a reason as to why people go to more extremes in these cases.

Studies conducted by Kuhberger (1995) and Mandel (2001) somewhat support the idea that the framing effects occur because of information that is unknown or missing. Kuhberger (1995) first notes that even when numbers are displayed in the Asian disease problem, there is still a lot that is unknown to the participant. For example, when stating that 200 people will be saved,



what will happen to the other 400 people is not specified (Li, & Xie, 2006). This is also the case in the loss frame where 400 people are said to surely die, but it is not mentioned that 200 will be saved. Using what is known as the additive method, Kuhberger (1995) made explicit what would happen to the other people not mentioned previously in the problem. Once these factors were made explicit, framing effects that were previously found vanished.

Fuzzy-trace theory states that verbatim-based analysis and gist-based intuition operate equally, and representations for each are also extracted equally (Reyna, & Brainerd, 2011). The two different systems communicate with one another in that they both extract different things from the situation at hand. Verbatim processing would provide any details that would be needed for analysis, in that it is the more precise and analytic of the two. Gist facilitates the processes dealing with intuition, and is a subjective interpretation based on emotion, experience, education culture etc., anything that adds to the essential meaning (Reyna, & Brainerd, 2011).

Reyna and Brainerd (2011) state that most adults prefer to make use of their gist-based intuition, even if the situation requires advanced reasoning. In other words, they prefer, and engage in, simpler processes when making decisions. Other theories, however, might put forward that when processing becomes too difficult, the increase in the cognitive load forces a simpler way of thinking, such as dual-processing theories (Reyna & Ellis, 1994; Reyna & Lloyd, 2006).

Reyna and colleagues believe that gist generally determines the actions that should be taken based on the information that it interprets. The example of the expert cardiologists can be referred to here. The cardiologist, due to years of experience, can make somewhat fully thought out decisions based on using his/her gist. As long as enough information is provided, the decision can be made using gist. If gist-based intuition is the main actor behind decision-making, then foreign languages in the Asian disease problem must disrupt this process in some way, in order for the framing effects to disappear. In foreign language situations then, verbatim-based analysis could take the lead in decision-making, and cause participants to focus more on the specific details of the frame, and therefore not be as affected by it.

### **3.3. Main research questions repeated**

To assist with the reading that follows in chapter 4, the main research questions of the thesis are repeated as follows:

1. Do individuals with prolonged exposure to, and use of, the L2 (in this case L1 Afrikaans – L2 English bilinguals) exhibit the same framing effect biases documented in previous research?
2. May language background variables, and L2 visualisation ability, account for the variation in the decisions made by this group?

## CHAPTER FOUR:

### METHODOLOGY

#### 4.1. Participant selection

Participant recruitment took place through the University of Stellenbosch as well as through personal channels. For recruitment through the University, participants were contacted using posts on the General Linguistics and Applied English Language Studies Sun Learn pages (which would then automatically be sent to their personal student emails as well) (see Appendix F, p. 109). The invitation was also sent to students who form part of the Afrikaans and Dutch department, in that it was felt students in this department formed part of the target language group. Students were also approached in two classes, which form part of the General Linguistics department, once the necessary permissions had been obtained from the relevant lecturers.

Snowball methods were also made use of in order to achieve the participant number aim. Participants who had been invited to partake in the survey were encouraged to pass on the information to any one they felt would match the participant requirements. Social media platforms such as Facebook and Instagram were used. My own profile, and the Stellenbosch Linguistics page were made use of on Facebook to advertise the experiment. The General Linguistics Multilingualism and Cognition Lab's account (@multicog\_lab), as well as SU Just Kidding (@sujustkidding) advertised the experiment on Instagram. Lastly, WhatsApp was also made use of to share the invitation to the research experiment (see Appendix G, p. 110). All of the above mentioned platforms served as a means for participant recruitment through social and personal channels.

Due to a delay in the start of data collection, incentives were made use of from the start of the data collection period as it was thought this would increase the speed at which data collection took place. As participants were only allowed to enter the lucky draw once the survey was completed, it was thought that having the lucky draw would ensure that participants would fully complete the survey.

Participants were informed that they could enter in a lucky draw to win one of ten R200 cash vouchers. It was also clearly stated to those participating that they were only allowed to

participate in the study (and therefore lucky draw) once, and any double entries would be removed from the study. The luck draw cash prizes were rewarded to the participants through a third party. This was done in order to ensure that the researcher could not identify the participants at any point during the study.

Informed consent was obtained by means of an electronic form that contained all the relevant information for the study, without giving away too much details with regards to what participants had to do and what the aim of the research was. Information given to participants had to be kept to a minimum in order to ensure that the results of the study were not skewed in any way due to the researcher's interference.

This information included informing the participants that they would complete two different tasks in the survey, as well as then providing biographical/background information (see Appendix D, p. 106). Participants were presented with the consent forms at the very beginning of the online survey. Only once the participant had read the study's information, and given their consent to participate, could they participate in the study.

## 4.2. Participant characteristics

275 people were recruited to participate in the experiment, and of these participants, 163 took part and fully completed the survey. Tables 1-3 present descriptive statistics of the participants' characteristics that took part in the survey.

*Table 1: Table containing current age, hours of language spoken per week, age at which English was acquired, and language proficiency ratings for Reading, Writing and Speaking (out of 5).*

	AGE	HOURS AFR P/W	HOURS ENG P/W	AGE LEARNED ENGLISH	ENG R PROF	ENG W PROF	ENG S PROF	AFR R PROF	AFR W PROF	AFR S PROF
<b>Mean</b>	21.98	68.89	34.04	5.08	4.59	4.27	4.08	4.64	4.40	4.64
<b>Std. Deviation</b>	4.29	45.33	31.93	2.63	0.64	0.82	0.89	0.65	0.83	0.67

*Table 2: Participant sex, and race/ethnicity.*

<b>Sex</b>	<b>Frequency</b>	<b>%</b>	<b>Race</b>	<b>Frequency</b>	<b>%</b>
Male	38	23.9	White	114	71.7
Female	121	76.1	Coloured	40	25.2
			Black	1	0.6
			Other	4	2.5

*Table 3: Languages spoken around (LSA) participants, and languages spoken to (LST) participants whilst growing up, as well as the participants' English Learning Context (ELC).*

<b>LSA</b>	<b>Frequency</b>	<b>%</b>	<b>LST</b>	<b>Frequency</b>	<b>%</b>	<b>ELC</b>	<b>Frequency</b>	<b>%</b>
Afrikaans only	89	56.0	Afrikaans only	117	73.6	Friends and family	62	39.0
Afrikaans and English	70	44.0	Afrikaans and English	42	26.4	Television, media, books	31	19.5
						Formal schooling	62	39.0
						Travel	3	1.9

Participants were required to be between the ages of 18 to 40 years. This age range allowed for participants to provide their own consent when partaking in the study (as all participants are legally considered to be adults). Any participants who fell below or above the age group were eliminated from the data pool. One participant had to be removed at this point as they were 42 years old, and out of the required age range.

Participants had to be fluent bilingual speakers, with Afrikaans as the language that they learned first, and also used regularly in daily communication. The participants were advised they needed to have English as the language they learned second, or in other words, L2 speakers of English. Any participants who did not have English and Afrikaans as their two languages, would not meet the requirements and would have to be removed from the data pool. An average of 34.86% was calculated for the percentage of time participants spent speaking English per week (participants in the English condition = 35.83%, participants in the Afrikaans condition = 33.89%). The remaining percentage represented the time speaking Afrikaans. These

percentages were based on the hours per week for Afrikaans and English that they reported in their background information.

Three participants proved to be English first language speakers, who were raised as first language English speakers from birth. These participants were removed from the data pool. This language factor helped to ensure that participants who took part in the research that was conducted for my Honours thesis would not qualify as participants in this study – and therefore help ensure participants had no prior knowledge on the experiment. For the Honours thesis, participants were required to be first language speakers of English, with Afrikaans as the second language they learned, and by default would not qualify to participate in the present study.

Participants were also informed that they would not be allowed to participate in the research if they had already participated in the research I conducted in the previous year. Participants were asked in the background information form how much of the task they understood if they received it in English, and what they believed influenced their choice making. All the participants who answered these questions indicated that they understood the task fully, and none of the participants answered that language influenced their choice in the task. For these factors then, no further participants were removed.

#### **4.3. Ethical issues**

Permission to carry out the research was requested from the Humanities Research Ethics Committee, in order to ensure that no participant would be negatively/psychologically affected by the tasks presented to him/her. This was also done to ensure that the research would not result in any data that could harm any particular and or minor group. A letter of permission was also requested from the University itself in order to obtain institutional permission to make use of Stellenbosch University students. This area proved to be problematic as the permission from the institution took almost three months to obtain.

As mentioned in the participant information section above, participants also needed to provide a contact number in order to take part in the lucky draw after the survey had been completed. It was suggested that it would be safer for the participants if their contact information was to be stored separately from their participation in the survey and any background information they

provided. In this way, if any of the information was obtained by outside parties the data would be recorded separately and would not be able to be used in any way to harm the participants by these outside parties.

For example, information like the age, sex and race of the participant would not be linked to a contact number for the participant. In order to overcome this, two separate surveys were created, which would save the data collected on two separate spreadsheets. At the end of the survey, the participant was given a link to follow if they would like to participate in the lucky draw. Here, all that was asked of the participant was a preferred contact number to be entered into the lucky draw, and therefore, presented the only information that was recorded on this data sheet. Participants were also asked for a preferred contact number, instead of an email address for example, as email addresses could contain people's full names – and in turn give away their identities. Contact numbers helped ensure participants still remained anonymous to the researcher.

The institutional permission was the main reason for the hindrance of receiving ethical clearance, as a letter proving one has institutional permission needs to be attached to the application for ethical clearance. Institutional permission was obtained and ethical clearance soon thereafter (project number GENL-2019-9431). It was decided that Psytoolkit (Stoet, 2010; 2017) would be the platform on which the survey would be run. The fact that Psytoolkit was a platform that used very little data, and that the survey would take between 25-30 minutes, proved to be beneficial. Participants were invited to participate in the survey by sharing information on the requirements to participate, as well as a link to follow if they wished to participate.

Participants were informed that their participation was completely voluntary in the form of a letter of consent which had to be read and agreed to before they were allowed to continue with the research (see Appendix E, p. 108). They were also informed that they would be able to leave the experiment at any time, without it harming them in any way. Their responses were kept anonymous throughout the survey.

If participants needed to be referred to in the write up of the study, it would be done by means of a randomly generated participant number, or in averages as statistics. Keeping participants' responses anonymous would be in their best interest as they may feel that they could be judged based on the choices they make in the moral dilemmas. This could help ensure that participants

respond to the study honestly, and do not feel pressurised to choose a certain decision over another (therefore skewing the data).

#### **4.4. Methodology and methodological issues**

In the majority of studies that conduct research on foreign language effects, paper-and-pen, or online survey methods were used for data collection. By this it is meant that participants were, in most cases, required to read and respond to tasks either online, on a computer in a laboratory set up, or on paper in a classroom setting.

Collecting data using online surveys and classroom settings proves to be advantageous as it allows for plenty of data to be collected from participants in a shorter period of time, making this method somewhat more efficient than other data collection methods. For example, data collection that requires face-to-face participation could sometimes take up to a minimum of 30 minutes per person. This could be very time-consuming if the research requires that only one person participates at a time. This leads to yet another advantage of online and classroom participation, in that many participants can participate simultaneously – making the data collection period shorter.

Another advantage to making use of online data collection methods is that the person in charge of the data collection does not need to necessarily be trained in any specific way. For example, a digital platform like Psytoolkit proves to be one which the user can teach him/herself to use. This platform provides two different types of interfaces, one for users who are familiar with the program and its coding language. The other interface, still somewhat a work in progress, can be used by researchers who are new to the platform. The frequently asked questions (FAQ) section also proves to be useful if the user may find him/herself stuck at any point when setting up his/her survey.

Online forms also help to further ensure the anonymity of the participant in that the person is not required to meet the researcher in order to participate in any face-to-face research. One could then argue that a classroom setting would not be beneficial in this way in that the researcher is still meeting with the participants in person as they would with face-to-face data collection methods (unlike research conducted online). A classroom setting with an attendance



of over 100 individuals, however, serves the same purpose for keeping the participant anonymous in that each participant is not singled out.

For research focusing on choice-making in moral situations especially, anonymity might help influence the participant to respond more truthfully than they would when feeling pressured by in-person research. In general, people are more likely to be honest (even if it seemingly makes them look like a bad person) if they know that what they have said or done cannot be traced back to them. Online research could also ensure that more people participate in that they do not have to leave the comfort of the environment they are in, as travelling could potentially be problematic for in-person research.

The environment in which online and in-person research takes place, brings forth a possible disadvantage to online research. In most cases of online platform data collection, the researcher cannot control all the variables of the environment in which the participant is doing the experiment. For example, if the amount of light exposure was deemed to play a role in the research participation, it would not be advisable to have such research be completed online/where the participant can complete the research in his/her chosen environment.

Christensen et al., (2014) conducted research on how arousing a dilemma could be for certain participants. It was suggested that the level of arousal of the dilemma could be influenced by a factor like reaction time (as participants who respond/make their choices quicker, will find the level of arousal of the stimulus to be higher). If a study needs to pay attention to participants' response times in order for it to contribute to the results, it would be important to ensure that the distractions do not disrupt the participant during his/her participation, as response time would serve as an important variable to the interpretation of the results. Previous research conducted on the effects of foreign language have not found that time plays a significant role in the data collected. For this reason for the research in this thesis, the time the individual takes to complete the survey will not be analysed.

#### **4.4.1 Materials and procedure**

##### **a. Risk scenario**

The main task in the current experiment was, as mentioned above, the two risk scenarios (gain and loss versions), in which the participants had to decide between choosing between program A and program B to combat the outbreak of the Asian disease (modified to anthrax disease in

the current work). These tasks are also displayed in Appendix A (p. 97). In its English and Afrikaans versions, it is presented as follows:

**English version:**

Imagine that our South African region is preparing for the outbreak of an unusual (anthrax) disease, which is expected to kill 600 people. Two alternative programmes to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programmes are as follows...

**Afrikaans version:**

*Verbeel dat ons Suid-Afrikaans streek besig is om gereed te maak vir die uitbreek van 'n ongewone (antraks) siekte, wat verwag word om tot die dood van 600 mense te lei. Twee alternatiewe programme om die siekte te beveg is voorgestel. Aanvaar dat die presiese wetenskaplike skattings van die gevolge van die programme soos volg is...*

With each of the presented dilemmas, the participant was given two different programmes to choose from, which can either be presented as a gain or loss version.

**English gain version:**

- If Programme A is adopted, 200 people will be saved.
- If Programme B is adopted, there is 33.3% chance that 600 people will be saved, and 66.6% chance that no people will be saved.

**English loss version:**

- If Programme A is adopted, 400 people will die.
- If Programme B is adopted, there is 33.3% chance that nobody will die, and 66.6% chance that 600 people will die.

**Afrikaans gain version:**

- *Indien Program A aangeneem word, sal 200 mense gered word.*
- *Indien Program B aangeneem word, is daar 'n 33.3% kans dat 600 mense gered sal word, en 'n 66.6% kans dat niemand gered sal word nie.*

**Afrikaans loss version:**

- *Indien Program A aangeneem word, sal 400 mense sterf.*
- *Indien Program B aangeneem word, is daar 'n 33.3% kans dat niemand sal sterf nie, en 'n 66.6% kans dat 600 mense sal sterf.*

The English version was adapted from the original version introduced by Tversky and Kahneman (1981). The country of the outbreak was changed to the South African region in order to match the context that the participant finds him/herself in (as was done in previous research). The Afrikaans version was translated from English, and then back-translated to eliminate any potential inconsistencies.

**b. Classification task**

The second task that participants had to take part in was the classification or visualisation task. Each participant was presented the second task in the language in which they received the main task. So, if a participant was randomly assigned to the main task in Afrikaans, they also received the second task in Afrikaans. Four different classification tasks were composed, to match the four different main tasks that the participants were randomly assigned to.

Each classification task contained a SHAPE, CATEGORY, SHAPE order. Within each section, 24 different trials were presented to each participant (see Appendix B, p. 98, and Appendix C, p. 102), one trial, however, had to be removed from the Afrikaans SHAPE task due to spelling error. Each trial itself contained three words. Participants had to decide which word/object was odd based on the section it was presented in. For example, English participants would be presented with the following layout:

Select the odd word based on SHAPE.

- Turtle
- Seal
- Tortoise

Participants were first presented with 24 trials like this, and were asked to select which one they thought was odd. From here on, the participants were only presented with the word 'SHAPE' above the options, instead of the sentence 'Select the odd word based on SHAPE'. Only once the block was completed and the next block started, was the sentence reintroduced.

This was done as an attempt to draw the attention of the participant, so they could be aware that the block changed what it was asking of them. After completing the block, they were presented with the next block which was based on category:

Select the odd word based on CATEGORY.

- Ball
- Apple
- Frisbee

Once again, after the first trial, participants were only presented with the word ‘CATEGORY’, until they completed the block. Once participants had completed this, they were presented with the last block of 24, based on selecting the odd one out for shape again. Afrikaans participants received the same test layout, the only difference was that their blocks were presented in Afrikaans (see Appendix C, p. 102).

Two different shape combinations were made (this can be referred to as SHAPE 1 and SHAPE 2), as well as two different category combinations (CATEGORY 1 and CATEGORY 2). Participants who were randomly assigned to the English gain version main task, received the order of SHAPE 1 + CATEGORY 1 + SHAPE 2. Those who were assigned to the English loss version were given the order SHAPE 2 + CATEGORY 2 + SHAPE 1.

This was done in order to ensure that participants would be highly unlikely to receive the exact same task/task layout. Within each combination, the order of the items were also randomized to further ensure this. Those participants who were assigned to the Afrikaans gain version, were given the same presentation series as those who received the English gain version (except it was presented in Afrikaans), and the same goes for those who were assigned to the Afrikaans loss version.

Two t-tests were run on participants background variables for each frame version (in both the L1 and L2 conditions) in order to determine whether the groups that were presented with the same frames were compatible with one another. The results are presented in Table 4 and Table 5 below.

*Table 4: T-test results on background variables in the English and Afrikaans gain version.*

	<b>T</b>	<b>p</b>
<b>HOURS AFR P/W</b>	0.032	0.975
<b>HOURS ENG P/W</b>	-0.379	0.706
<b>AGE LEARNED ENGLISH</b>	0.352	0.726
<b>ELC</b>	-0.453	0.652
<b>ENG R PROFICIENCY</b>	-0.139	0.890
<b>ENG W PROFICIENCY</b>	-0.273	0.786
<b>ENG S PROFICIENCY</b>	1.887	0.063
<b>AFR R PROFICIENCY</b>	-1.539	0.128
<b>AFR W PROFICIENCY</b>	-1.344	0.183
<b>AFR S PROFICIENCY</b>	-0.201	0.841

*Table 5: T-test results on background variables in the English and Afrikaans loss version*

	<b>t</b>	<b>p</b>
<b>HOURS AFR P/W</b>	-0.773	0.442
<b>HOURS ENG P/W</b>	0.282	0.778
<b>AGE LEARNED ENGLISH</b>	-0.465	0.644
<b>ELC</b>	-0.673	0.503
<b>ENG R PROFICIENCY</b>	0.505	0.615
<b>ENG W PROFICIENCY</b>	1.749	0.084
<b>ENG S PROFICIENCY</b>	1.444	0.153
<b>AFR R PROFICIENCY</b>	0.000	1.000
<b>AFR W PROFICIENCY</b>	0.218	0.828
<b>AFR S PROFICIENCY</b>	0.477	0.635

From the values obtained in the Tables 4 and 5 above, all of the background variables proved to not show any significance. The English reading proficiency of the loss version appears to be the only variable that is approaching trend ( $p = .084$ ), but does it does not reach significance. This would indicate that the groups in the tasks were compatible with one another, as their background variables barely produced any significance.

#### **4.4.2 Differences from Hayakawa and Keysar's (2018) visualisation study**

Choosing to give the same layouts to participants who received the same main task, but in a different language, would leave the language the task is received in as the factor that differed between the groups. This was also the case in the visualisation task conducted by Hayakawa and Keysar (2018), which was used to inform the task at hand. A few differences between this study and the former, were the number of blocks participants had to complete, as well as a second task used by Hayakawa and Keysar (2018) which included images.

In their study, Hayakawa and Keysar (2018) presented participants with four blocks (including two shape blocks, and two category blocks). In the present study, it was deemed appropriate to use two shape blocks and one category block. This was done in order to reduce the length of the task, in that the visualisation task was not the only task in which the participants had to take part (they also had to complete the main task). Also, dropping one category block was seen as the appropriate substitution, in that the task was focused on the difference results that might appear in a visualisation task among different language groups.

The shape blocks prompt participants to visualise each object presented to them in each trial, in order to determine which object is odd. The category blocks only require participants to have worldly knowledge in order to determine the odd one out. For example, if participants are presented with the items 'toothbrush, toothpick, and soap', one's general knowledge would inform one that toothbrush and soap belong to the toiletries category, whereas toothpick does not (and ultimately becomes the odd one out).

Hayakawa and Keysar (2018) also made use of a picture task in their study. This was done to ensure that the results which the participants produced was not just the outcome of misunderstanding the words presented to them. Performing a task like this one would be highly important in a study where participants are being asked to participate in their native and foreign languages.

In most cases, the proficiency levels of a participant in his/her native language are higher than that of his/her foreign language. This would mean that in some cases, participants might not recognise the word in one of the tasks, and might choose it to be the odd one out because they do not understand what it means. In this case then, a picture task would prove to be useful, in that the researcher can determine if the results received are truly a case of visualisation, and not just misunderstanding. The picture tasks would remove the action of having to picture the objects in order to determine which one is odd.

In the case of the present study, the context and language of the current participants differ significantly from that of Hayakawa and Keysar's (2018). It is not uncommon in the South African context to find speakers with differing first languages, who are very proficient L2 speakers of English. For this research, it was required for participants to be L1 Afrikaans, L2 English.

In most cases, Afrikaans speakers in the Western Cape, with a tertiary education or vocational training, have an advanced English proficiency, which does not compare to the more basic proficiency levels found among the foreign language speakers studied in previous research. It was therefore decided that the results that may be found in the study would be unlikely to be caused by misunderstanding, and therefore only the word task was used.

If one recalls the purpose of this task as well, it was to figure out if visualisation accuracy differs for different languages, and a picture task would not contribute to this. Any misunderstandings due to proficiency would also present itself in the categorisation block in the study. If participants were truly struggling to understand which item was odd because of a lack of proficiency, they would perform badly in both the shape and categorisations blocks (and therefore perform badly overall). If the participant struggles with the shape blocks, yet performs well enough in the categorisation block, then the results could be said to be due to the inability to visualise the object.

## 4.5. Data analysis

The responses for each of the dilemmas were organised into two-by-two contingency tables similar to the following:

	Program A	Program B
English gain/loss version	$n$	$N$
Afrikaans gain/loss version	$n$	$N$

### 4.5.1 Main task analysis

Participants who selected the safer option, were coded as 0, and those who selected the gamble were coded as 1. In other words then, the choice of program A would be coded as 0, and the choice of program B would be coded as 1. For each group in each task the number of participants who chose each program was tallied. This was then also converted to a percentage in order to determine the percentage of participants who chose each program in each group.

The data was analysed using *IBM's SPSS Statistics 23*, as well as *JASP 0.11.0.0*. The Wald's chi-square test was used to determine whether the choices made in the main task carried any statistical significance. When experiments are conducted, the outcome can either show significance or non-significance. When a result is significant ( $p < .05$ ), it is likely that it follows the research on which it is based and indicates that some sort of effect was found. When the result is non-significant, it means that no effect occurred (and possibly that the current results do not reflect that found in previous research).

If a result is non-significant ( $p > .05$ ), it could be interpreted in two different ways. One of these interpretations would be that the results provide evidence for a null hypothesis, and therefore provides proof against a theory that might have predicted the opposite (Dienes, 2014). A non-significant result however could also mean that the data itself is not sensitive enough to be evidence of a null hypothesis, and the data cannot be used to provide evidence against previously found results (Dienes, 2014).



A Bayesian analysis can help determine which of the two results fall under when they are non-significant. It would therefore be of importance to run this analysis on the results of the main task. If it is the case that the results in the current study do not carry any significance, the test will determine whether the lack of an effect that may be found is either due to a lack of data sensitivity, or if it is the result of a true null hypothesis. This would determine that the statistical power of the test was indeed strong enough, and that the lack of an effect is not due to data insensitivity (Dienes, 2014). Bayesian factors between 0 and 1 are more likely to fall under the null hypothesis.

#### **4.5.2 Visualisation/classification task analysis**

For the results of the visualisation task, participants' individual scores were calculated for how they performed in each of the blocks. The results were also then totalled, and an average percentage for each participant was calculated (based on how they performed overall in the three blocks). For the English participants, this equated a mark out of 72, whereas for the Afrikaans group the mark had to be changed to 71 (due to problematic trials). It should be noted that any participant who scores an accuracy average below 33% for the three blocks, will be eliminated from the data pool, as his/her results could be seen as the result of misunderstanding, or a lack of attention given to the task at hand.

Performance on the shape task alone was also taken into consideration as this proved to be the main focus of the task (performance in L2 and native language conditions). For this, a percentage was calculated out of 48 for the English groups, and 47 for the Afrikaans groups. For the results of the visualisation task, item scores were also calculated for each trial. For each trial the correct answer was determined, and used to calculate how many participants chose the correct answer for each trial. The percentage would be calculated by summing up the amount of correct answers and dividing it by the amount of participants in that group.

Lastly, Cronbach's alpha was run on the visualisation task's individual items. In many testing conditions in research, researchers attempt to create tests that are reliable and valid, in order to enhance the accuracy of the results of the test. It is of utmost importance to ensure that the instrument one uses to conduct research is both valid and reliable. Validity refers to the "extent to which an instrument measures what it is intended to measure" (Tavakol & Dennick, 2011: 53). Reliability, deals with the "ability of an instrument to measure consistently" (Tavakol & Dennick, 2011: 53).

Cronbach's alpha provides a way to indicate a test's reliability, as the test cannot be considered valid unless it is also reliable. It provides a measure for the internal consistency of a test, and is expressed as a value between 0 and 1. The closer the value is to 1, the less likely it is that the results of the test are due to error, and the more likely it is that the instrument measures what it is set out to measure. A value between 0.70 and 0.95 are deemed as acceptable values of alpha to reflect test and instrument reliability (Tavakol & Dennick, 2011). The value of alpha, however, can also be effected by the length of the test that is undertaken, as well as if the items in a test have poor interrelatedness (Tavakol & Dennick, 2011).

If a test is too short, and contains too few questions, the value of alpha could decrease. This is why it is important to include more items testing the same concept, as it would lead to an increase in the alpha value. This was done in the current study by including two shape blocks into the survey (as it was the main focus of the classification task).

If the items in the test generate an alpha that is approaching zero, both the items in the test, as well as the length of the test should be revised. However, a score that is approaching 1, should also be considered revisable in that the test might contain items which appear to be redundant. Tavakol and Dennick (2011) indicate that a maximum value of 0.90 is recommended, and any value higher than this should coax the researcher to revise the test items.

## CHAPTER FIVE:

### RESULTS

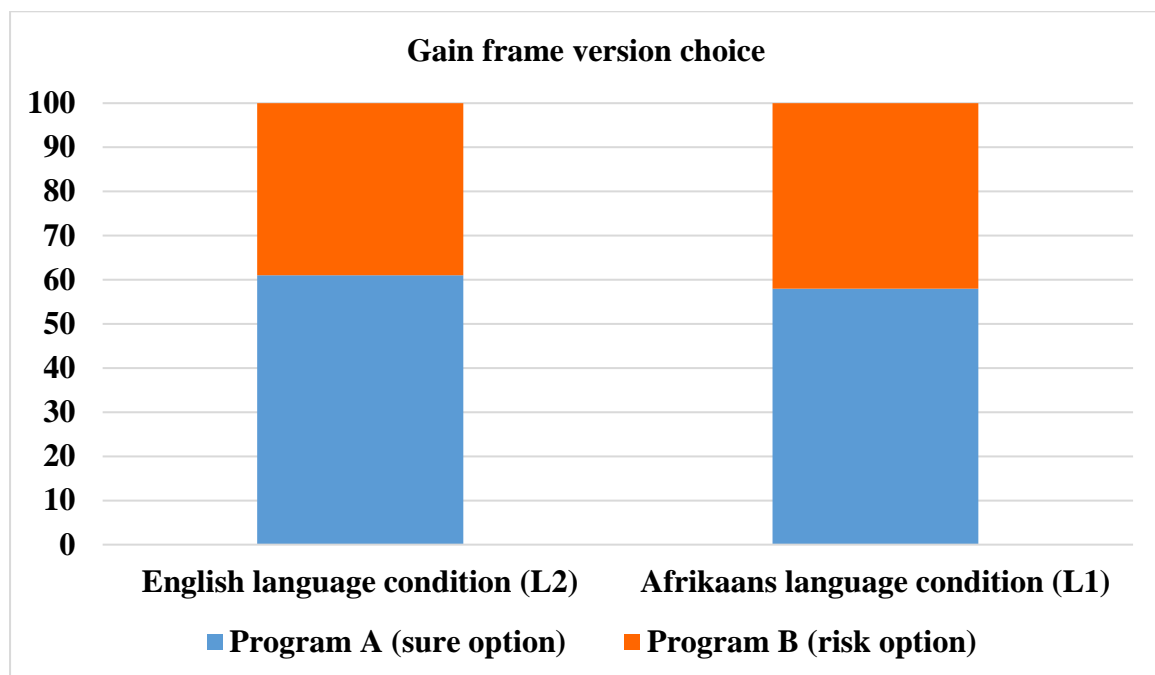
#### 5.1. Results for the main task

According to the results of previous research, the frame in which a framing effect is most present in both the foreign and native language conditions, would be the gain frame. This means that in both of these language conditions, participants were more likely to choose the option where they could (for certain) save 200 out of the 600 lives. This choice was presented as program A, and constitutes the sure option. The risky option in this frame would be the gamble of a 33.3% chance of saving all 600 lives, or a 66.6% chance of saving no one. This choice was presented as program B.

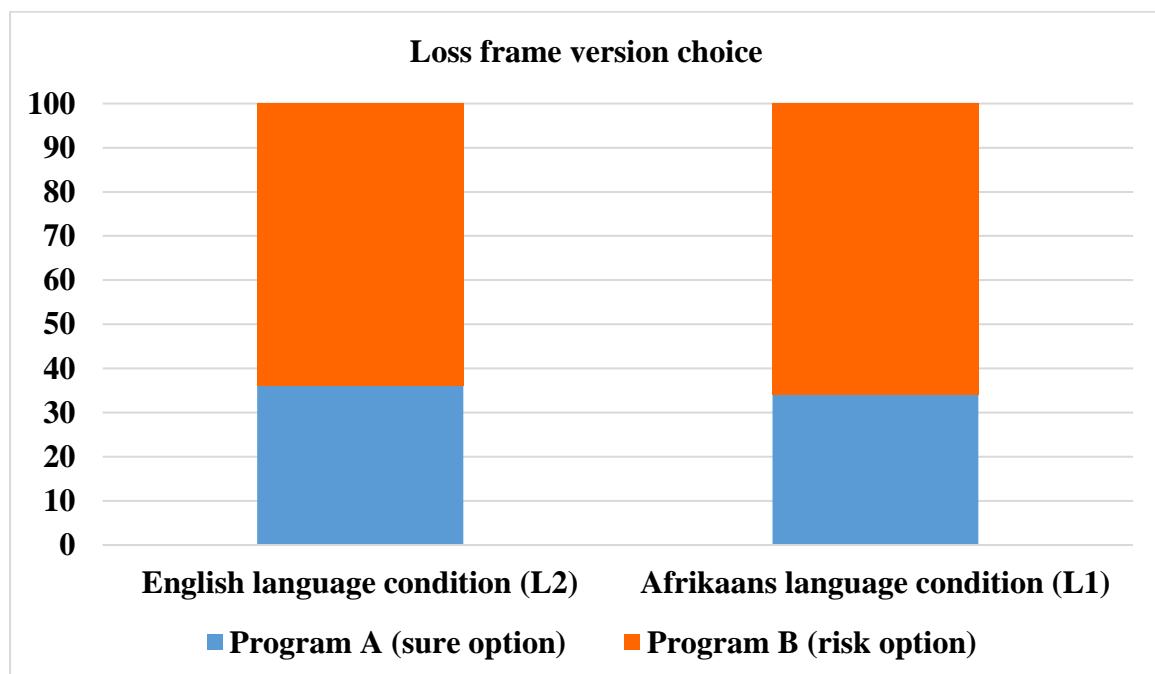
As depicted in Figure 2, participants in the gain frame condition for both language groups were more likely to choose program A, the sure option. This outcome corresponds with previous research findings, as the results show that 61% of the participants chose program A in the English gain frame (39% program B), and 58% chose program A in the Afrikaans gain frame (42% program B).

The frame where the framing effect faltered in previous research would be the loss frame of the foreign language condition. The loss frame in the native language condition of past research still proved to exert a framing effect on the choices made by participants, in that participants were more likely to choose the risky option over the sure option (or program A over program B). The sure option in this frame would be the certain death of 400 out of 600 lives (i.e. program B), whereas the risky option would be the gamble of a 33.3% chance of no one dying, and a 66.6% chance of everyone dying (i.e. program B).

As depicted in Figure 3, participants in both language conditions were more likely to choose program B, the risky option. This result does not correspond with previous research, in that some type of framing effect still remains in that the participants were influenced to choose the risky option based on the frame it was presented in. This preference for risk was reflected in the loss frame of both language conditions, as 64% of the participants chose program B in the English condition (36% program A), whereas 66% chose program B in the Afrikaans condition (34% program A).



*Figure 2: Graph displaying choices for the gain frame of the English and Afrikaans groups.*



*Figure 3: Graph displaying choices for the loss frame of the English and Afrikaans groups.*

As was the case with previous research, the key focus of the main task would be the reduction of the effect in the loss frame version of the task, when participants complete it in their second or foreign language. It would therefore be important to separate the groups based on the frame which they received, as well as the language in which it was received. For this reason, the English and Afrikaans gain frame will be compared here, and the English and Afrikaans loss frame. The results of the Chi-square test were as follows:

*Table 6: Table depicting the p-values calculated for the English and Afrikaans gain frame.*

	Value	df	p
<b>X<sup>2</sup></b>	0.102	1	0.749
<b>N</b>	82		

*Table 7: Table depicting p-values calculated for the English and Afrikaans loss frame.*

	Value	df	p
<b>X<sup>2</sup></b>	0.017	1	0.896
<b>N</b>	77		

In the gain frame version of the task, depicted in Table 6, when comparing the English and Afrikaans language condition, totals of 61% and 58% chose program A (the safe option) respectively in each condition ( $p = .749$ ). In the loss frame version of the task, depicted in Table 7, when comparing the English and Afrikaans language condition, totals of 64% and 66% chose program B (the risky option) respectively in each condition ( $p = .896$ ). A factor needs to produce a p-value of less than 0.05 in order to be deemed as statistically significant. Based on the p-values of 0.749 and 0.896, calculated by the test, the results of the main task did not reach statistical significance.

This suggests that the second language of these participants did not reduce the framing effect of the loss version, as the majority of participants in both language groups were still persuaded to choose the risky option – due to the framing of the scenario. The responses in this task then do not reflect what has been found in previous research, as the foreign and second languages in previous research reduced the effect of the frame in the loss condition.

The next step in the analysis would be to check if the non-significance of the test results in both the gain and loss frames of both the English and Afrikaans scenarios were due to a lack of statistical power (i.e., maybe an effect could have been detected with a larger sample), or whether the data reflected a true null-effect. This would be performed by running a Bayesian factor analysis on the main tasks. The groupings for this test remained the same as the groupings used in the chi-square.

*Table 8: Results of the Bayesian analysis for the English and Afrikaans gain frame.*

	Value
<b>BF<sub>10</sub> independent multinomial</b>	0.279
<b>N</b>	82

*Table 9: Results of the Bayesian analysis for the English and Afrikaans loss frame.*

	Value
<b>BF<sub>10</sub> independent multinomial</b>	0.268
<b>N</b>	77

The Bayesian analysis of the gain frame in Table 8 produces a value of  $BF_{10} = .279$ , whereas the loss frame in Table 9 has a value of  $BF_{10} = .268$ . Due to the fact that both of these values are lower than 0.33, this constitutes evidence that the non-significant results do indeed provide robust support for the null hypothesis, and that the sample sizes were strong enough to support the data. This would mean that the current data actually runs counter to the results found in previous research, in that the lack of a reduction on the framing effect in the loss frame was not the outcome of the weak evidence.

## **5.2. Assessing the influence of individual language background variables on framing effects**

Due to the results in the previous section showing that a framing effect still carried in the L2 condition of the loss frame, the next step for the analysis would be to exhaust any possibility that the language backgrounds of the participants may moderate the choices made by the participants. These variables will be run on the main task using a logistic Wald's chi-square regression. Since the main task would expect the L2 (in this case English) to carry an effect, it will be paid close attention to. Although, since the speakers reported such high proficiency results in both languages, it would be best to consider both languages.

**Table 10: English background information variables in the Afrikaans and English gain version – English Learning Context (ELC), English Speaking (S), Writing (W), and Reading (R) proficiency ratings out of 5, the amount of hours per week speaking English, and the age at which English was acquired.**

	<b>Standard Error</b>	<b>Wald's <math>\chi^2</math></b>	<b>df</b>	<b>p</b>
<b>AGE LEARNED ENG</b>	0.105	1.809	1	0.179
<b>ELC</b>	0.290	0.104	1	0.747
<b>HOURS ENG P/W</b>	0.009	7.486e -5	1	0.993
<b>ENG R PROFICIENCY</b>	0.466	1.202	1	0.273
<b>ENG W PROFICIENCY</b>	0.401	0.547	1	0.460
<b>ENG S PROFICIENCY</b>	0.351	1.652	1	0.199

**Table 11: English background information variables in the Afrikaans and English loss version - h English Learning Context (ELC), English Speaking (S), Writing (W), and Reading (R) proficiency ratings out of 5, the amount of hours per week speaking English, and the age at which English was acquired.**

	<b>Standard Error</b>	<b>Wald's <math>\chi^2</math></b>	<b>df</b>	<b>p</b>
<b>AGE LEARNED ENG</b>	0.114	0.234	1	0.629
<b>ELC</b>	0.292	0.014	1	0.907
<b>HOURS ENG P/W</b>	0.008	0.022	1	0.881
<b>ENG R PROFICIENCY</b>	0.457	0.039	1	0.844
<b>ENG W PROFICIENCY</b>	0.429	5.415e -4	1	0.981
<b>ENG S PROFICIENCY</b>	0.373	0.060	1	0.807

According to the data presented above in Table 10 and Table 11, none of the English variables in each frame and language group appeared to play any significant role in the choices that were made, in that their p-values were all too great to be considered significant. The closest variable to significance in the loss frame appears to be the age at which the participants learned English ( $p = .179$ ), this value is, however, still far from significant, as the p-value is considerably greater than .05.

In order to be as thorough as possible, the Afrikaans background variables were placed into the regression in order to test their significance on the main task. It should be noted that the age at which participants, and how participants learned Afrikaans were not asked of them in the

background questionnaire. This is due to the fact that participants were required to be native speakers of Afrikaans, and therefore should have learned Afrikaans from birth, and in their home environment.

*Table 12: Afrikaans background information variables in the Afrikaans and English gain version - Afrikaans Speaking (S), Writing (W), and Reading (R) proficiency ratings out of 5 and the amount of hours per week speaking Afrikaans.*

	<b>Standard Error</b>	<b>Wald's <math>\chi^2</math></b>	<b>df</b>	<b>p</b>
<b>HOURS AFR P/W</b>	0.006	0.004	1	0.947
<b>AFR R PROFICIENCY</b>	0.774	4.402	1	0.036
<b>AFR W PROFICIENCY</b>	0.609	2.058	1	0.151
<b>AFR S PROFICIENCY</b>	0.548	0.686	1	0.408

*Table 13: Afrikaans background information variables in the Afrikaans and English loss version - Afrikaans Speaking (S), Writing (W), and Reading (R) proficiency ratings out of 5 and the amount of hours per week speaking Afrikaans.*

	<b>Standard Error</b>	<b>Wald's <math>\chi^2</math></b>	<b>df</b>	<b>p</b>
<b>HOURS AFR P/W</b>	0.005	0.046	1	0.829
<b>AFR R PROFICIENCY</b>	0.564	0.407	1	0.524
<b>AFR W PROFICIENCY</b>	0.509	1.243	1	0.265
<b>AFR S PROFICIENCY</b>	0.511	0.455	1	0.500

The only variable that reaches significance in Table 12, which depicts the Afrikaans background variables for the gain frame version of the task, is the Afrikaans reading rating ( $p = .036$ ). This would indicate that the reading rating of the participants had significance on the choice made in the main task, in that those who rated their reading abilities higher, were more likely to choose program A than those who rated themselves lower. The other Afrikaans background variables do not reach significance, and would appear to not play a role for choice making in both framing versions of the task.

### **5.3. Results for the visualisation/classification task**

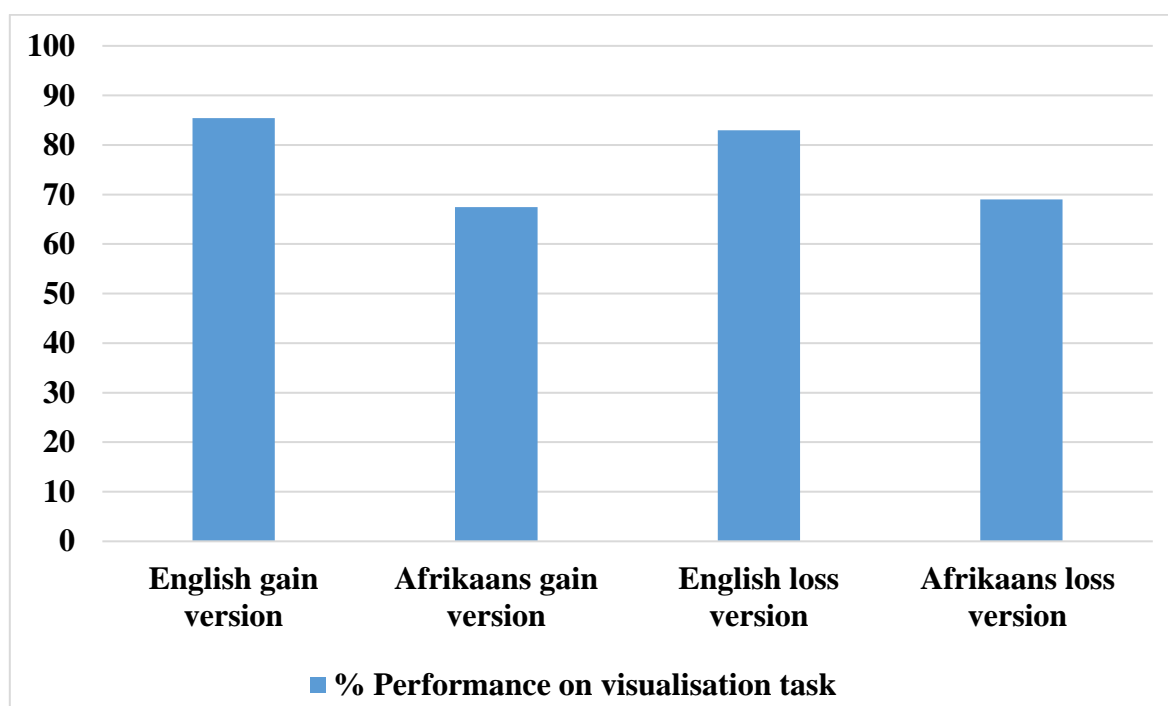
It is important to note that the visualisation task was included in this study in order to determine whether the participant's ability (or lack thereof) to visualise a scenario would affect the choice



that they made in the main task. Previous research proposed that those who performed better in correctly identifying (and therefore visualising) the odd item, could better visualise the scenarios in which choices needed to be made, and this better visualisation would influence the choices that they made.

For this reason, one of the first test results to focus on would be a Wald's chi-square regression, paying attention to the participant's individual performance scores in the classification task. Specifically focusing on how they performed in the shape tasks only. The reason for the focus on the shape task is that this task required participants to visualise the objects presented to them.

The categorisation task required participants to have worldly knowledge in order to determine which item was odd (which does not provide much information on their ability to visualise stimuli). The shape task test results, for this reason, should provide a clearer indication of the participant's ability to visualise the stimuli (item scores are attached in Appendix H, p. 111 – which excludes participants who achieved less than 33% for the task). Taking a look at the average of the individual scores for each of the participants presented in Figure 4, it is clear that the group who received the visualisation task in the English condition outperformed those who received the task in Afrikaans.



*Figure 4: Graph displaying the average percentage of individual performances for the visualisation task of each language condition and frame.*

The averages for the groups were English gain: 85.42%, Afrikaans gain: 67.44%, English loss: 82.95% and Afrikaans loss: 68.98%. The English language conditions therefore outperformed each of the Afrikaans conditions by at least 13%. An independent samples t-test was run in order to determine if the results of the test were significant, the results thereof are presented in Table 14 and Table 15 below.

*Table 14: T-test results for the English and Afrikaans gain frame on the performance on the visualisation task.*

	<b>t</b>	<b>p</b>
<b>SCORE OVERALL</b>	5.172	< .001

*Table 15: T-test results for the English and Afrikaans loss frame on the performance on the visualisation task.*

	<b>t</b>	<b>p</b>
<b>SCORE OVERALL</b>	2.773	0.007

From the p-values calculated by the t-test, it is evident that the participants' performance in the task was significantly affected by the language in which the task was presented – further emphasizing that those in the L2 condition outperformed those in the L1 condition. The groups are displayed as such, as the Afrikaans and English gain version received the same presentation series, leaving the language the series was presented in as the differentiating factor. The same applies for the loss version. Any participants who received a percentage less than 33% for this task were removed from the data pool (participants were presented with three options, guessing at random would still allow for the achievement of a percentage equal to or above 33%). Using these performance variables, the results for the Wald's Chi square regression were as follows:

*Table 16: Displaying the results of the Wald's Chi square regression of the visualisation task performance (shape only) for the Afrikaans and English gain frame.*

	<b>Standard Error</b>	<b>Wald's <math>\chi^2</math></b>	<b>df</b>	<b>p</b>
<b>Shape Total</b>	0.015	0.005	1	0.942

**Table 17: Displaying the results of the Wald's Chi square regression of the visualisation task performance (shape only) for the Afrikaans and English loss frame.**

	<b>Standard Error</b>	<b>Wald's <math>\chi^2</math></b>	<b>df</b>	<b>p</b>
<b>Shape Total</b>	0.013	0.042	1	0.837

Based on the p-values received for each of the framing conditions in Table 16, gain ( $p = .942$ ), and in Table 17, loss ( $p = .837$ ), the participants' performance in the visualisation task did not have a significant effect on the choices that they made in the main task. This would suggest that visualisation, in this case, does not play a role in the choices made by participants in the scenario.

For the rest of the tests on the visualisation task, the data will be separated according to language groups, as the task itself focused on the differing language conditions affecting the participant performance in the task. For the next step, the English gain and loss frames will be analysed together, and the Afrikaans gain and loss frames together. In order to determine if any background variables played a role in the differences in performance between the two language groups, the data will be placed into a linear regression to determine the p-values for the language variables.

**Table 18: Results of linear regression for the Afrikaans condition on visualisation task considering hours of Afrikaans spoken per week, Afrikaans Reading (R), Writing (W), and Speaking (S) proficiency ratings, hours of English spoken per week, age at which participant learned English, and English Reading (R), Writing (W), and Speaking (S) proficiency ratings.**

	<b>Standard Error</b>	<b>t</b>	<b>p</b>
<b>HOURS AFR P/W</b>	0.046	0.080	0.936
<b>AFR R PROFICIENCY</b>	5.302	0.840	0.405
<b>AFR W PROFICIENCY</b>	4.531	-0.674	0.503
<b>AFR S PROFICIENCY</b>	3.474	-0.228	0.820
<b>HOURS ENG P/W</b>	0.064	1.097	0.278
<b>AGE LEARNED ENGLISH</b>	0.761	0.297	0.767
<b>ENG R PROFICIENCY</b>	3.757	1.318	0.193
<b>ENG W PROFICIENCY</b>	3.192	-4.621e -4	1.000
<b>ENG S PROFICIENCY</b>	2.818	-1.476	0.146

**Table 19: Results of linear regression for the English condition on visualisation task considering hours of Afrikaans spoken per week, Afrikaans Reading (R), Writing (W), and Speaking (S) proficiency ratings, hours of English spoken per week, age at which participant learned English, and English Reading (R), Writing (W), and Speaking (S) proficiency ratings.**

	<b>Standard Error</b>	<b>t</b>	<b>p</b>
<b>HOURS AFR P/W</b>	0.048	1.563	0.123
<b>AFR R PROFICIENCY</b>	5.100	-1.811	0.074
<b>AFR W PROFICIENCY</b>	4.273	1.396	0.167
<b>AFR S PROFICIENCY</b>	3.871	0.390	0.698
<b>HOURS ENG P/W</b>	0.065	0.888	0.378
<b>AGE LEARNED ENGLISH</b>	0.724	0.024	0.981
<b>ENG R PROFICIENCY</b>	3.801	1.607	0.113
<b>ENG W PROFICIENCY</b>	4.047	-0.956	0.342
<b>ENG S PROFICIENCY</b>	3.073	0.938	0.351

The only variable of both data sets in Tables 18 and 19, that comes closest to being significant is the value generated by the English condition's Afrikaans reading proficiency rating ( $p = .074$ ). None of the other variables appears to produce a p-value close enough to be considered significant for the outcome of individual performances of the participants, and it would therefore seem that they exert no influence on the participants' performances.

In order to determine that the results obtained in the visualisation task were not due to the test being unreliable (and therefore invalid), Cronbach's alpha was used to test the classification task's individual items. The results of Cronbach's alpha can only fall between 0 and 1, and in order to reflect reliability the test needs to generate a score that falls between .70 and .90 for each measurement item.

**Table 20: Results of Cronbach's alpha based on the four testing groups (divided by frame – and therefore presentation series – and language).**

	<b>Cronbach's Alpha</b>
<b>ENGLISH GAIN FRAME</b>	0.74060035
<b>ENGLISH LOSS FRAME</b>	0.79329813

<b>AFRIKAANS GAIN FRAME</b>	0.82074644
<b>AFRIKAANS LOSS FRAME</b>	0.79061531

The result of each group falls between the values of .70 and .90. Each of the values presented in Table 20, therefore indicate that the data instrument has internal consistency. The internal consistency of the test reports to the researcher that the instrument likely measures what it has been set out to measure.

These values support the reliability of both the test and testing instrument. Due to the alpha values not approaching  $\alpha = .70$ , the researcher is informed that there were enough items present in the test (as an alpha value that is too low would indicate that there were not enough items in the test). Another positive derived from the result would be the fact that the values generated by Cronbach's alpha did not come close to approaching  $\alpha = .95$ , which indicates that the test did not contain too many factors that appeared to be redundant.

## CHAPTER SIX:

### DISCUSSION

#### 6.1 Research questions and results

To reiterate, the research questions were:

1. Do individuals with prolonged exposure to and use of the L2 (in this case L1 Afrikaans – L2 English bilinguals) exhibit the same framing effect biases documented in previous research?
2. May language background variables, and L2 visualisation ability, account for the variation in the decisions made by this group?

Judging by the results found in the main task, participants who acquired both Afrikaans (L1) and English (L2) are likely to be risk-averse when situations are presented in terms of gains, and risk-seeking when they are presented in terms of losses. To explain, when these bilinguals were presented with the problem, and were instructed that the choices they made would ‘save’ lives, they were more likely to choose program A, the sure option, over program B. This is evident as 61% of those in the L2 condition chose program A, whereas 58% chose program A in the L1 condition. This shows a clear aversion to taking a risk when the situation was framed in terms of gain, as program B was the gamble option and chosen less than 42% of the time.

Those who were presented with the frame which stated that a certain number of people would ‘die’, were found to be risk-seeking in both language conditions. As explained in section 5.1 (p. 64), this is the frame in which previous research found language to have an effect in that participants in the non-native condition, are less influenced by the frame, and therefore less risk-seeking in this condition, choosing to equally avert and seek the risk. This was not the case in the current study, as participants remained risk-seeking, by choosing program B to an almost equal extent in both the L1 and L2 conditions (L2 = 64% of the time, L1 = 66% of the time)

These results answer the second research question, in that the data produced by the participants reflects a different bias than what was found in previous research. The non-native language condition in previous research papers has induced a pattern of participants responding more randomly in the frame of the loss version, rather than being influenced by the frame to be more

risk-seeking. In the results of this study, participants presented a risk-seeking bias in the loss frame, as much as those presented a risk-aversion bias in the gain frame.

This leads to the conclusion that in each framing version of the task, participants were influenced by the frame presented to them, and in turn behaved as native speakers would in both language conditions. One could then infer that these participants act in the same way as native speakers would, due to their high proficiency ratings in their second language (none of the proficiency ratings averaged lower than 4.08 out of 5), and also that participants did engage with the English language during their week (speaking it an average of 34.86% of the time). Although these background variables did not reach significance in the data analysis in that they explained the variation in the participants' responses, they could still exert an influence on the results reflecting in the way they did.

The Afrikaans reading proficiency rating of the participants in the gain frame variable appeared to be significant when placed into the chi-square test (reflecting a value of  $p = .036$ ). Although the task does involve the task of reading text and making selections, the contribution of this factor's significance proved difficult to interpret. The factor itself also just reaches significance, and after multiple tests on these factors, the risk of the value being a false positive increases.

Virtually no other background variables appeared to exert an influence on the choices made by the participants, and trying to determine the reason for this result proves to be difficult, as immersion in the L2 context should allow for some kind of influence of the L2 variables. One of these reasons could be the unreliability of participants using self-reported measures when completing background information. Factors like proficiency and frequency of use could differ in their significance if objective measures were used to determine these values. Also, frequency of use is itself composed of many differing subcomponents, and without this information, one would not be able to determine whether one of these subcomponents could actually be significant to the outcomes of the research. For example, Bylund & Athanasopoulos (2015) found in their study on motion events, that advanced foreign language speakers of English (L1 Swedish), showed preference for the English way of categorising motion due to their frequency of viewing television in English (which in itself is a different form of exposure).

The second research question also deals with the outcomes of the classification/visualisation task. From the results provided by the test in chapter five, it is clear that in both presentation series for the classification task, the groups of participants who were placed into the English

language condition outperformed those who were placed in the Afrikaans condition. As mentioned in section 5.3 (p. 69), the groups who formed part of the English condition outperformed those of the Afrikaans condition by at least 13%. The results of this test also opposes that found in previous research, in that the L2 condition proved to accurately identify the odd item more often than those of the native language condition. Although the L1 participants performed more poorly in this task, this performance did not present itself as a problem, as the English performance was what was relevant for the current study in determining how it could influence choice-making in the main task.

The participants who were part of the foreign language condition in the study conducted by Hayakawa and Keysar (2018), proved to identify the odd items less accurately than those in the native language condition. Hayakawa and colleagues (2018) then went on to propose that the lack of the ability to correctly identify the odd shape out, could infer that the participants cannot visualise things as well in their foreign language – and therefore make choices in scenarios that differ from the norm. With the current thesis, the results of the study found that participants in the English condition could visualise and identify odd items better than those in the Afrikaans condition, which would imply (according to research on framing effects) that these participants should be able to respond to scenarios in the same way that native speakers should.

When taking a look at the results in the main task, it would seem that this proposal holds true. In both the English and Afrikaans language conditions, participants made choices that indicated that they were influenced by the frame in which the choices were presented (as they were risk-averse for gains, and risk-seeking for losses). This would further imply that in both conditions the participants responded to the main task in the same way that native speakers of each language would. Once again it would be important to mention how different the language and acquisition context of the Afrikaans L1 speakers are in this study, compared to the foreign language and L2 speakers in previous research.

## **6.2 Theories proposed for language effects with regards to the results**

For this part of the discussion, each of the proposed theories that provide possible reasons for the effects that languages carry with regards to risk taking will be considered, once again a brief description of each theory will be provided for the benefit of the reader, while taking into



account the results of the current thesis. This section will also focus on the discussion of the results of the main task, in that the classification task in itself presents a means to describe why language effects happen in the way that they do.

### **6.2.1 Dual process of reasoning and thinking**

To reiterate, in the dual processes account, with regards to decision-making, System 1 is seen as the more automatic of the two which provides quick, general judgements of the situation, whereas System 2 acts in supervisory manner. In most cases, the quick judgement of System 1 is accepted by System 2, but if the task becomes too difficult, System 2 will intervene and if necessary, override the judgement passed by System 1 (Frankish, 2010).

As mentioned in section 3.2.1 (p. 38), tasks, and therefore judgement, can become too difficult if the language in which the task is presented changes. For example, a person who has a lower proficiency in a foreign language might find reading a task in a foreign language more difficult than reading it in their native tongue. If this is the case, System 2 kicks in and changes its role from a supervisor, to go over the decision made by System 1, and possibly override it (Frankish, 2010). In the case of the loss frame of the main task, people who participate in their foreign language might initially make the judgement of program B being the better choice (as guided by the framing of the options), as advised by System 1's default judgement making.

Due to the increased difficulty of performing the task in a foreign language, System 2 might fully play its role as a supervisor, and provide slower and more rational thinking when determining which program best suites the situation (Winkel, et al., 2016). System 2 might then reduce the effects brought about by the frame version, and override System 1's choice of program B. The action of the override would cause participants to choose program A instead, realizing that 200 people would still be saved if this choice was made. The reason for the split decision in the loss frame between foreign language speakers then, could be due to some participants finding the task easier than others.

The results of this study, however, indicate that for both the L1 and L2 conditions, System 1 provided a default judgement, and System 2 acted only in a supervisory manner. This would then cause participants to make a choice between the programs, based on what the loss frame made seem more suitable – as System 1 does not lead the individual to think more logically. When considering the background variables of these L2 speakers, the theory seems plausible in that the participants in this study have a considerably high proficiency in their L2 (and also

routinely engage with the language outside of a classroom context). These factors differ from participants who were foreign language speakers in previous research. The participants in the current study might then have found the task to be simpler, did not engage the workings of System 2, and therefore were still influenced by the frame in the loss version.

### **6.2.2 Indiscriminant and strategic risk-taking account**

The indiscriminant risk-taking account provides reasoning that differs from that provided by the dual process theory. Instead of believing that difficulty in task completion causes participants to engage in thinking that allows them to see the picture for what it is, the theory proposes that foreign languages cause individuals to behave impulsively, as it distances these individuals from their moral standards (Hayakawa et al., 2019). In this case, no matter the situation, when acting in their foreign language, individuals will be more risk-seeking, even if it is not the better option of the two.

The cognitive load in this case causes individuals to be less perceptive, and affects their ability to discriminate between risks of lower and higher levels (Hayakawa et al., 2019). This account could also provide reasoning for the difference in participants' choices from previous research, in that the majority of participants explained that they grew up with both the L1 and L2 in their surroundings. Participants then choose to be more risk-averse in gain frames, and risk-seeking in loss frames, because their L2 does not distance them as much from their morals, and allows them to see the scenario for what it is. Once again then, due to their proficiency in the language, their cognitive load is not as heavy as it would be to a foreign language speaker, which allows them to discriminate between risk levels.

The strategic risk-taking account states that foreign language use allows participants to be less influenced by their emotions, and to therefore partake in risk taking that is more calculated or strategic (Hayakawa et al., 2019). In this case then, some people in the foreign language condition choose program B in the loss frame, and sacrifice 400 lives, because they realize that strategically saving 200 lives would be better than taking a risk which could involve the loss of all lives. Whichever option presents itself as the most strategic is then the option that people in the foreign language would choose.

In the current study, once again due to the participant profiles, participants in the L2 condition would not be as distanced from their emotions. This would not allow them to think in a strategical manner, and in turn choose based on their emotions the way native speakers would.

Strategically, it would be safer to choose the sure option over the risk. Those in the L2 condition choose program B more often in the loss version, because of the emotion that the possibility of losing 400 lives brings. They therefore find that taking the gamble of a 33.3% chance of no one dying is better than the sure chance of 400 people dying.

### **6.2.3 Prospect theory**

Prospect theory states that in life in general individuals are more likely to be risk-averse, in that people are far more sensitive to losses than they are to gains (Huang & Rau, 2018). This sensitivity is what causes individuals to try to avoid risk as much as possible, and is seen as the reason why individuals choose the sure option of program A in the gain frame. The theory further states that in order for a gamble to be worth considering, the individual in the situation needs to feel that the potential gain that comes with the gamble needs to be twice as much as they could potentially lose (Kahneman, 2011).

With regards to the results found in the current study, participants in both language conditions appeared to adopt this general tendency to avert the risk in the gain frame. It is likely that the fear of the potential of saving no lives in the gamble of this scenario, triggers the participants' sensitivity to loss, and caused the participants to be loss averse. When the options were presented in the loss frame however, the likelihood of saving 200 lives is not only doubled, but tripled in the gamble of program B – as the program presents a 33.3% chance of no one dying.

Once again, the current participants appeared to follow the pattern found in the prospect theory, in that they only chose to take the gamble when the amount of lives that could potentially be saved were increased by more than double the amount that could be lost. Foreign languages therefore reduce this tendency to choose a gamble that is favourable, and cause participants to choose equally between program A and B in the loss frame, which opposes the findings in the current research.

### **6.2.4 Equate-to-differentiate theory**

As was discussed in section 3.2.4 (p. 42), the equate-to-differentiate theory states that participants make their choices based on deciding which of the options presented to them is considered weaker, and which is considered dominant. Decision-making in this case is therefore not made out of fear of one over the other, but rather that one option appears to be stronger in favour than the other. It also states that this option has to be at least as good as the

other in most aspects, and better than the other in at least one other aspect to be considered the dominant option (Li, & Xie, 2006).

In the gain frame then, participants consider program A to be the dominant option, rather than trying to avoid the outcome of program B, or making a choice based on fear. Program A equates program B in that in both cases there is the possibility of lives being saved, therefore it is at least equal in most aspects. The aspect where it differs is that program A ensures that a certain amount of lives will definitely be spared, and does not mention the possibility of lives lost like program B does. In this one aspect then, program A could be considered better than program B, and for these reasons it constitutes the dominant option in the gain version.

In the loss frame version, participants who partake in the task in their native tongue, find that program B represents the dominant option. Explaining the choice according to this theory then, program A and program B both mention that there will be a loss of a certain amount of lives. Once again this makes these two options equal in most aspects. Program B in this version however, also mentions the possibility of no lives being lost. Because program A does not explicitly state the amount of lives that would be saved in this scenario, program B appears to be better than program A in at least one aspect. This then makes program B the dominant choice in the loss version, and program A the weaker one.

In the current study, it appeared that the participants' thought processes worked in this manner, in that in each scenario there was a dominant preference for either program A, or program B. In both language conditions, participants were then convinced that the programs were better than each other (in the differing frames) in at least one aspect, and therefore cause the large differences in preference for each option. In order to find out if this was the case in this type of experiment however, the words or values of the scenario would have to be altered. If participants were made explicitly aware of all the lives lost and saved in each scenario, with each program, the dominance of each option could shift and cause participants to choose differently. One would have to question then if a test was conducted which explicitly stated all the variables in the scenario, what kinds of consequences would it have for the interpretations pursued in previous research (if any).

### 6.2.5 Fuzzy-trace theory

Fuzzy-trace theory, a type of dual-process theory, proposes two different ways of thinking which are said to be involved in decision-making. These two ways are intuitive processing (which can be compared to gist-based processing, or System 1 in the dual processing theory), and analytic processing (which can be compared to verbatim-based reasoning or System 2) (Reina, & Brainerd, 2011). The theory infers that all we need to make decisions (in most cases) is gist-based processing, especially as we grow older, as this type of reasoning is quick and becomes more advanced as we gain life experience.

For decision-making in a native tongue, gist-based reasoning should be able to provide enough information on the situation to allow the participant to make a decision based off the gist information only. Those who operate in an L2 or foreign language, however, might need to make use of their verbatim-based reasoning, due to the increased difficulty of the task at hand, as well as the unfamiliarity with it (Reina, & Brainerd, 2011). This could then cause participants in this language condition to choose differently when making a decision between the programs in risk-type scenarios.

The results of the current study, however, seem to indicate that the participants in the L2 condition perform on the same level as those in the L1 condition as in both language conditions participants preferred program A in the gain version and program B in the loss version. One would expect that if there were a difference in the type of processing, that this would result in the participants in the different language conditions making a different decision.

This would indicate that those in the L2 condition are also working off gist-based processing, and once again this pattern in choice making could be due to the different language context that these participants find themselves in. Participants in this context have more opportunities, than those in past research, to engage with the language made use of in the L2 condition. This could then result in the participant experiencing more things in their L2 than those in previous research, and the need for verbatim processing in these scenarios would then never arise – and participants would make choices similar to that of native speakers.

### 6.3 The influence of context and the WEIRD bias

As mentioned in the previous section, the factor of the context in which the current study took place appears to have a big influence on the results that were found in both the main task, and the classification task. One could, however, claim that in the current study the participant's L2 was used, whereas previous research was conducted using participant's foreign language. Even though this factor does differ, a study has been conducted previously by Huang and Rau (2018), in which the participants were also L2 speakers. Irrespective of being L2 speakers and not foreign language speakers, a framing effect still occurred in the loss frame version of that study. Participants in the current study chose between program A and B equally, and did not appear to be influenced by the specific frame the options were presented in. Huang and Rau's (2018) participants had also rated their L2 proficiency quite high, the same as was found in the current study.

Considering the results of the visualisation task, the current participants performed better in the L2 condition than they did in the L1. This also differs from previous findings (Hayakawa, & Keysar, 2018) conducted on item classification. Participants in previous research, who completed the task in their native language condition outperformed those in their foreign language condition. Once again, the context in which the study was conducted could play a large role in the results of this task (this notion will be expanded on below).

Another similarity between the study conducted by Huang and Rau (2018), and this one, is that the L2 focused on was the English language, leaving the L1s to differ (Afrikaans and Mandarin). Irrespective of these similarities in the testing conditions, participants in the current study were still influenced by the framing effect in the loss version. This leaves the researcher to think of which other differing factors could lead to the results found, and a recurring binding factor of the current participants, which differentiates them from the previously studied L2 speakers, would be the context in which the study took place, and what this context means for the background variables of these participants.

A highly likely factor of the South African context, is that the majority of L1 Afrikaans speakers in this context have engaged in a phenomenon called 'code-switching' at least once in their lives, specifically with the languages Afrikaans and English (see Deumert, 2005; Stroud, & Williams, 2017). Code-switching refers to the mixing of two (or more) languages, by bi- or multilinguals, while engaging in discourse (Ncoko, Osman, & Cockroft, 2000). In the

South African context, this code-switching normally takes place multiple times in an interaction, within a single sentence (van Dulm, 2009).

In many cases when a native speaker of Afrikaans is unsure of the word for a particular item in Afrikaans, they would resort to using the English word for it (as it is assumed that the speaker they are engaging with will also have a good enough command of the English language to understand). With the individual constantly making use of code-switching and English loanwords, the Afrikaans word might have a weaker mental representation, and become less accessible to him/her in future.

It is believed that this could have been the case with regards to the results in the visualisation task, as participants could have possibly known only the English version of the item, and not the Afrikaans translation. This could lead the participants to visualise an item incorrectly, or to choose an incorrect item as the odd one out, and in turn influence the rate of accuracy with which the task was performed. These factors could help explain why the participants in the L1 condition, performed more poorly than those in the L2 condition.

The South African context is rich with language diversity (as indicated in the linguistic diversity index in section 2.12, p. 35), considering that the country has 11 official languages (Ncoko, et al., 2000). The likelihood therefore, of only encountering one language on a regular basis is very slim. Also, people in this context are highly unlikely to be completely monolingual. Even if they are not fluent speakers of another language, they are still provided with enough opportunities to encounter these other languages in their daily routine. This includes learning English as a subject through formal schooling, as well as general, social interactions outside of this formal context. This would be the case for the majority of the participants in this study, as a language that can be assumed to be mutually intelligible for most people in urban settings of this country would be English.

In many cases, English is the L2 of speakers in South Africa, and in some environments people have to engage in their L2 more than they do their native language. These ideas of code-switching with English within a sentence, and being provided with many opportunities to engage with the language socially, rarely proves to be the case in the context of previous studies, in that English as an L2 is rarely encountered in the social environment, especially if the research is conducted in the country of origin of the native language. This also proved to be the case most of the time, as any participants who lived in a country for a certain amount of

months, where the target foreign language is spoken, were eliminated from the data pool (Winkel, et al., 2016, Corey et al., 2017).

These differences between L2 speakers of this study, and foreign language speakers and L2 speakers of previous studies, are believed to be the factors that most influence the difference in responses by participants in this study. According to previous research, the speakers in the L2 condition responded to the frame in the same way previous native language speakers would. If participants were given all these opportunities to interact with the L2 as explained here, and were also highly proficient in the L2, their responses would reflect to be different from those of previous studies.

This difference in itself further stresses the importance of conducting research in contexts other than WEIRD ones. Previous research, which has found similar responses in the framing tasks (where the effect of the loss version frame is reduced), for participants with similar language conditions, has done so in language contexts which do not allow for much interaction with the L2 or foreign language in the same way that the South African context does. Majority of the interactions outside of the formal settings in those contexts are conducted in the L1, and leave very little room for any social interaction with the L2.

In this case, South African speakers could form different types of relationships with their L2 (one which is possibly less cold and distant, and more emotional, or even one that does not distance them from their morals), and in turn produce different types of responses when participating in their L2. This is not, however, to say that participants in this context who have used the L2 for a prolonged period are unique compared to previous research, as participants who are fully immersed in their L2 may also be found in these WEIRD contexts. It is rather the social multilingualism that presents a unique aspect to the research, and that raises the question of whether additional languages (such as L2 and foreign languages), are necessarily different in terms of the behaviour they induce. For this reason, research conducted, and patterns of behaviour found in these WEIRD contexts should not be generalised to the rest of the world.



## CHAPTER SEVEN:

### CONCLUSION

#### 7.1 Concluding remarks

Language proves to be one of the most valuable skills to acquire as a human being, and yet at the same time it is acquired so effortlessly. All one needs to acquire language, is to be exposed to it, whether it be spoken or signed. Although it seems like once we have acquired a language, we regulate and control it through our use of it, language appears to have an influence on us – and at times can regulate our behaviour in certain situations (for example, when it comes to decision-making).

The previous research discussed in this thesis, which were concerned with language effects on behaviour, found that the way options are presented to an individual can affect their likelihood of choosing each option. The way the situation is presented to an individual is referred to as its frame (Christensen et al., 2014). When the options are framed positively, and spoken of in terms of gains (such as lives ‘saved’), individuals are more likely to choose the option which is a definite guarantee, over the one which could be considered a gamble. When options are framed negatively, and spoken of in terms of losses (such as lives ‘lost’), individuals switch their preference and are more likely to choose the gamble over the guarantee.

These patterns of responding in these framing situations, constitute findings based on individuals who performed the task in their L1. When asked however, to perform tasks in their foreign language or L2, the pattern in the second frame is less adhered to. In the gain frame then, individuals who are asked in their non-native language, still prefer to choose the guarantee over the gamble. In the loss frame however, instead of switching favour with the two options, individuals tend to pick randomly between the two – and do not show a stronger tendency for one over the other as is found in the L1 condition.

The current study attempted to replicate the previous studies by testing Afrikaans L1, English L2 speakers. The participants were presented with a modified version of the Asian disease problem. Participants in this study, however, did not reflect the same patterns that were found with those tested in their foreign language or L2. Instead of showing a preference for neither of the options in the loss frame, these participants reflected a pattern demonstrated by native

speakers, in that they preferred the gamble over the guarantee. These participants also preferred the guarantee over the gamble in the gain frame condition. These patterns were found in both the L1 and L2 conditions of the study. Based on the results of previous research, it would be safe to conclude that in both language conditions presented to them, participants in the current research behaved in the same way that native language speakers would.

Although there appears to be a pattern in the choice making of participants in previous research, researchers have still not reached consensus with determining what could cause such language effects to occur. A recurring theme in this area is the idea of the native language being closely associated with the emotions and morals of the individual, and the foreign and second languages being associated with cognition, and further from that which makes us moral (Keysar, et al., 2012).

These relationship differences then cause individuals to think differently, with either their emotions or logic, and lead them to make different choices in different languages. Another explanation is that the different languages cause individuals to engage with different types of thought processes or systems (Stanovich & West, 2000). These systems in themselves are once again connected with the ideas of performing an action due to emotion or due to cognition/logic.

Although these theories could potentially explain differences between choices of previous studies, they do not provide an explanation as to why the participants in the current study made choices that reflected the patterns of the native speakers in previous research. In their L2, participants should make choices that are more logical, and which are less influenced by morals. These participants, however, did not feel the best-suited option in the loss version was the guarantee of killing 400 people (whilst saving 200 – which in the problem is not explicitly stated). Instead, they believed the gamble to be the better option, even though a 66.6% chance that everyone would die existed.

When going over the theories presented to explain the reason a framing effect occurs, it appears that the one which corresponds most with the data in the current thesis would be that of the equate-to-differentiate theory. Participants choose to compare options to each other, and based on the information that is given (and that which is left out), the participants decide which of the options presented to them show dominance, and which was weaker. The information for

program A appealed to the participants as the dominant choice in the gain frame, whereas that of program B appealed to them in the loss frame in both the L1 and L2 conditions.

Another attempt at an explanation for the existence of an effect of language on choice, was brought forward by Hayakawa and Keysar (2018), who claimed that a difference in the ability to visualise a scenario could be the reason why participants make different choices in different languages. In order to test this, a classification task was conducted with participants, using their foreign and native languages. Those in the native language condition appeared to perform better at accurately identifying the odd item than those in the foreign language condition. It was then proposed that when individuals are performing these tasks in a foreign language, they struggle to visualise the situation in the same way as a native speaker does, and for this reason they make choices that differ.

In the current task, the results showed that participants in the L2 condition performed better in the task than those who received it in their L1 condition, by averaging a higher percentage for accurately identifying the odd items. One could conclude then that the idea of visualising does play an important role in decision-making, as it could be argued that because the participants could visualise the scenario described in the main task fairly clearly in both the L1 and L2 conditions, they ended up choosing similarly in both language conditions.

An important point brought up by previous research in this field, deals with the notion – if language effects the choices we make when we function in our L2 and foreign languages, what is the potential that this effect carries over to individuals who have to make important decisions in their non-native languages (such as those who have political power) (Corey, et al., 2017: 16). If decision-makers do indeed become less emotional in their thought – to the point of acting with impulsivity as the indiscriminant risk-taking account suggests (Hayakawa et al. 2017) – these effects could have far-reaching consequences for high-stake situations where decisions are made in the L2. In a South African context, this would also be the case since many of our decisions are made in the individual's second and sometimes third language. However, since the results in this study found no such effect of language, these warnings may prove to be overly cautious, and the influence of language may ultimately depend on the degree and length of immersion in the language, and not the fact that it is a second or foreign language.

## 7.2 Suggestions for future research

As it was clear that the context in which the study took place appeared to play a major role in the outcome of the results, it would be encouraged to note this in future research. It would be valuable to see if a similar test carried out in another South African context would yield similar results. If this is the case, and these results also differ from previous findings, it would provide further grounds for the interpretation that the specific linguistic context is the connection between the patterns. It would also be recommended to try and find a South African context, where the linguistic diversity index is lower (such as in the Northern Cape as indicated in the image in section 2.12, p.35).

A context with a lower linguistic diversity index would improve the chances of two random individuals sharing the same native language/mother tongue. In a case like this, the effects of the L2 might be carried stronger in that contexts where the index is lower, more people share the same L1, and social interactions would leave little room for code-switching. If participants use their L2 less in social interactions, the chances are that the results in the visualisation task would switch to reflect native language speaker dominance (in that they should be able to accurately identify more items in their L1).

The majority of participants in previous research were university students, and the majority of the experiments took place in a classroom setting on pen and paper. This means that the results in these studies could be limited to those with a tertiary education. It would then be advised for those in future research to have participants indicate whether or not they are university students. This was not done in the current study as the target group was more focused on certain language and age requirements than specifically university students.

The fact that previous research took place in a classroom setting could also influence the results that were previously found, as participants could discuss their answers with other individuals in the class, and might change their responses due to this (although, ideally, this would have been controlled for). This in-person type setting could also influence the results as individuals might want to hide certain aspects about themselves, and in turn would lie when making their response. These factors would need to be considered when deciding which medium to use for the data collection process.

The data collection in this study was conducted online, as it was thought to be the more efficient manner to collect data. Online participation does, however, have its own downfalls. In this

case, the researcher also cannot control the environment the participant is in when data collection occurs online, leaving many variables to be considered. If it is important for the researcher in future studies to control the environment and manner in which the participant takes part in the research, it would not be advised to perform the data collection online.

Although there is a lack of control when it comes to certain factors with online data collection, it does also have its perks. In moral dilemmas, or scenarios like those found in the current research, it would be important for the participants to feel that they can answer the question truthfully without any judgement being passed on them. One of the best ways, in most cases, to receive truthful feedback, is when the person giving the feedback is kept anonymous. The anonymity of an online survey could therefore facilitate more truthful responses from the participants (especially if they are alone when completing the survey).

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## Appendices

### Appendix A: Hypothetical scenarios (English and Afrikaans version)

Asian Disease Problem (modified)\*:

**ENGLISH:** Imagine that our South African region is preparing for the outbreak of an unusual (anthrax) disease, which is expected to kill 600 people. Two alternative programmes to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programmes are as follows:

(Gain version)\*:

If Programme A is adopted, 200 people will be saved.

If Programme B is adopted, there is 33.3% chance that 600 people will be saved, and 66.6% chance that no people will be saved.

(Loss version)\*:

If Programme A is adopted, 400 people will die.

If Programme B is adopted, there is 33.3% chance that nobody will die, and 66.6% chance that 600 people will die.

**AFRIKAANS:** *“Verbeel dat ons Suid-Afrikaans streek besig is om gereed te maak vir die uitbreek van ‘n ongewone (antraks) siekte, wat verwag word om tot die dood van 600 mense te lei. Twee alternatiewe programme om die siekte te beveg is voorgestel. Aanvaar dat die presiese wetenskaplike skattings van die gevolge van die programme soos volg is:*

*(Wins weergawe)\*:*

*Indien Program A aangeneem word, sal 200 mense gered word.*

*Indien Program B aangeneem word, is daar ‘n 33.3% kans dat 600 mense gered sal word, en ‘n 66.6% kans dat niemand gered sal word nie.*

*Watter program kies u? Program A of Program B?*

*(Verlies weergawe)\*:*

*Indien Program A aangeneem word, sal 400 mense sterf.*

*Indien Program B aangeneem word, is daar ‘n 33.3% kans dat niemand sal sterf nie, en ‘n 66.6% kans dat 600 mense sal sterf.*

*Watter program kies u? Program A of Program B?”*

**Participants will not be shown any of the information marked with an asterisk (\*).**

**Appendix B: Classification task list (English condition)****SHAPE 1**

1.	BALL	APPLE	FRISBEE
2.	PENCIL	STICK	ERASER
3.	ORANGE	CIRCLE	SQUARE
4.	CHOPSTICK	PENCIL	FORK
5.	ONION	APPLE	BANANA
6.	CARROT	MUSHROOM	PEN
7.	BALL	TOMATO	BAT
8.	HAND	FOOT	GLOVE
9.	PIZZA	COIN	NOTE
10.	BUTTON	NEEDLE	CLOCK
11.	RECTANGLE	BRICK	CIRCLE
12.	PARACHUTE	DIAMOND	KITE
13.	ENVELOPE	DOOR	HANDLE
14.	WIRE	STRING	NET
15.	FLOWER	TREE	BROCCOLI
16.	TELEVISION	PAPER	PEN
17.	COIL	SPRING	WIRE
18.	ROCK	PEA	STONE
19.	BOX	CUBE	PYRAMID
20.	HOLY CROSS	SWORD	SHIELD
21.	EAR MUFFS	EARPHONES	HEADPHONES
22.	PLANE	JET	HELICOPTER
23.	FISHING ROD	POOL CUE	BOAT
24.	BASKETBALL	RUGBY BALL	SOCCER BALL

**SHAPE 2**

1.	JACKET	SHIRT	PANTS
2.	TURTLE	TORTOISE	SEAL
3.	LIME	LEMON	BANANA
4.	RING	HEADBAND	CLIP
5.	FRAME	BOOK	DESK
6.	EGG	RUGBY BALL	SOCCER BALL
7.	FOOT	HAND	FOOTPRINT
8.	SQUIRREL	RAT	MOUSE
9.	BUTTON	ZIPPER	CENT
10.	CORN	PEPPER	CUCUMBER
11.	CUPCAKE	MUFFIN	FLAPJACK
12.	SPIDER	CRAB	FISH
13.	DICE	SALT	CUBE
14.	TREE TRUNK	CYLINDER	CONE
15.	BOWLING BALL	BOWLING PIN	DODGEBALL
16.	PIZZA	BISCUIT	TOMATO
17.	DOUGHNUT	LIFEBUOY	CUPCAKE
18.	TRAFFIC CONE	TRIANGLE	TRAFFIC LIGHT
19.	MANGO	OLIVE	PEACH
20.	PEARL	DIAMOND	PEA
21.	LIQUORICE	STRAW	LOLLIPOP
22.	PANCAKE	CLOCK	WAFFLE
23.	DOOR	RECTANGLE	CIRCLE
24.	CEREAL BOX	BRIEFCASE	BOWL

**CATEGORY 1**

1.	SHAMPOO	KEY	DEODORANT
2.	DESK	CHAIR	FILE
3.	SHIRT	BRUSH	PANTS
4.	TELEVISION	MONITOR	DISC
5.	BALL	APPLE	FRISBEE
6.	MILK	CHEESE	BREAD
7.	PENCIL	STICK	ERASER
8.	CHICKEN	CHEESE	STEAK
9.	FORK	KNIFE	SHEET
10.	WALLET	BAG	PURSE
11.	SPONGE	CLOTH	SPOON
12.	RICE	CARROT	BROCCOLI
13.	MOP	BROOM	BOX
14.	CAT	SNAIL	DOG
15.	BED	PILLOW	SOCK
16.	LAMP	COUCH	CHAIR
17.	APPLE	BANANA	LETTUCE
18.	BEE	FLY	ANT
19.	HAIR	FOOT	HAND
20.	COMB	HANDLE	BRUSH
21.	ORANGE	CIRCLE	SQUARE
22.	DRAWER	CUPBOARD	MAT
23.	CHOPSTICK	PENCIL	FORK
24.	BREAD	ROLL	BALL

**CATEGORY 2**

1.	BEE	ANT	LIZARD
2.	RAIN	SUN	CLOUDS
3.	ONION	APPLE	PEAR
4.	BED	BATH	SHOWER
5.	SHIP	BOAT	HELICOPTER
6.	PLATE	BOWL	KNIFE
7.	LETTUCE	GRAPE	CUCUMBER
8.	PARROT	CAT	PIGEON
9.	STRING	ROPE	CUP
10.	JET	AIRPLANE	BOAT
11.	RIVER	TREE	SEA
12.	CHICKEN	CHEESE	MILK
13.	SHARK	DOLPHIN	MOUSE
14.	ONE	EIGHT	SIX
15.	CARROT	PEN	MUSHROOM
16.	BALL	BAT	TOMATO
17.	STRAWBERRY	PEANUT	CASHEW
18.	BOOT	HAT	SANDAL
19.	BAG	PACKET	TOWEL
20.	SCISSOR	TISSUE	KNIFE
21.	BUTTER	TOOTHPASTE	SOAP
22.	LIPSTICK	EYESHADOW	PAINT
23.	CAR	BICYCLE	TRUCK
24.	FLOWER	GRASS	SNAKE



**Appendix C: Classification task list (Afrikaans condition)****VORM 1**

25.	BAL	APPEL	FRISBEE
26.	POTLOOD	STOK	UITVEËR
27.	LEMOEN	SIRKEL	VIERKANT
28.	EETSTOKKIE	POTLOOD	VURK
29.	UI	APPEL	PIESANG
30.	WORTEL	SAMPIOEN	PEN
31.	BAL	TAMATIE	KOLF
32.	HAND	VOET	HANDSKOEN
33.	PIZZA	MUNTSTUK	NOOT
34.	KNOOPIE	NAALD	KLOK
35.	REGHOEK	BAKSTEEN	SIRKEL
36.	VALSKERM	DIAMANT	VLIEËR
37.	KOEVERT	DEUR	DEURHANDVATSEL
38.	DRAAD	LYN/STRING	NET
39.	BLOM	BOOM	SPRUITKOOL
40.	TELEVISIE	BLAAI	PEN
41.	KRONKELING	SPRING	DRAAD
42.	ROTS	ERTJIE	KLIP
43.	DOOS	KUBUS	PIRAMIDE
44.	HEILIGE KRUIS	SWAARD	SKILD
45.	GEHOORBESKERMERS	OORFONE	KOPFONE
46.	VliegTUIG	STRAALVliegTUIG	HELIKOPTER
47.	VISSTOK	SNOEKERSTOK	BOOT
48.	BASKETBAL	RUGBYBAL	SOKKERBAL

**VORM 2**

25.	BAADJIE	HEMP	BROEK
26.	SEESKILPAD	SKILPAD	SEËL
27.	NAARTJIE	SUURLEMOEN	PIESANG
28.	RING	KOPBAND	KNIP
29.	RAAM	BOEK	EMMER
30.	EIER	RUGBYBAL	SOKKERBAL
31.	VOET	HAND	VOETSPoor
32.	EEKHORING	ROT	MUIS
33.	KNOOPIE	RITSSLUITER	SENT
34.	AGURKIE	PEPER	KOMKOMMER
35.	KOLWYNTJIE	MUFFIN/TEEKOEKIE	PANNEKOEK
36.	SPINNEKOP	KRAP	VIS
37.	DOBBELSTEEN	DRIEHOEK	KUBUS
38.	BOOMSTOMP	SILINDER	KEGEL/KEËL
39.	BOULWERKBAL	BOULSPELD	VLUGBAL
40.	PIZZA	KOEKIE	TAMATIE
41.	OLIEBOL	REDDINGSBOEI	KOLWYNTJIE
42.	VERKEERSKEGEL	DRIEHOEK	VERKEERSLIG
43.	MANGO	OLYF	PERSKE
44.	PÊREL	DIAMANT	ERTJIE
45.	DROP	STROOI	SUIKERPOPPIE
46.	PANNEKOEK	KLOK	WAFEL
47.	DEUR	REGHOEK	SIRKEL
48.	GRAAN BOKS	AKTETAS	BAK

**KATEGORIE 1**

25.	SJAMPOE	SLEUTEL	LIGGAAMSBESPUTING
26.	LESSENAAR	STOEL	LÊER
27.	HEMP	BORSEL	BROEK
28.	TELEVISIE	REKENAARMONITOR	SKYF
29.	BAL	APPEL	FRISBEE
30.	MELK	KAAS	BROOD
31.	POTLOOD	STOK	UITVEËR
32.	HOENDER	KAAS	BIEFSTUK
33.	VURK	MES	LAKEN
34.	BEURSIE	SAK	RUGSAK
35.	SPONS	WASLAP	LEPEL
36.	RYS	WORTEL	SPRUITKOOL
37.	MOP	BESEM	DOOS
38.	KAT	SLAK	HOND
39.	BED	KUSSING	SOKKIE
40.	LAMP	RUSBANK	STOEL
41.	APPEL	PIESANG	BLAARSLAAI
42.	BY	VLIEG	MIER
43.	HARE	VOET	HAND
44.	KAM	DEURHANDVATSEL	BORSEL
45.	LEMOEN	SIRKEL	VIERKANTE
46.	LAAI	KAS	MAT
47.	EETSTOKKIE	POTLOOD	VURK
48.	BROOD	ROL	BAL

**KATEGORIE 2**

25.	BY	MIER	AKKEDIS
26.	REËN	GRAS	WIND
27.	UI	APPEL	PEER
28.	BED	BAD	REËNBUI
29.	SKIP	DUIKBOOT	HELIKOPTER
30.	PLAAT	BAK	MES
31.	BLAARSLAAI	DRUIF	KOMKOMMER
32.	PAPAGAAI	KAT	DUIF
33.	LYN	TOU	KOPPIE
34.	STRAALVLEIGTUIG	VLEIGTUIG	BOOT
35.	RIVIER	BOOM	SEE
36.	HOENDER	KAAS	MELK
37.	HAAI	DOLFYN	MUIS
38.	EEN	AGT	SES
39.	WORTEL	PEN	SAMPIOEN
40.	BAL	KOLF	TAMATIE
41.	AARBEI	GRONDBOONTJIE	OKKERNEUT
42.	TEKKIE	HOED	PLAKKIE
43.	SAK	VADOEK	HANDDOEK
44.	SKÊR	SNEESDOEKIE	MES
45.	BOTTER	TANDEPASTA	SEEP
46.	LIPSTIFFIE	VERFKWAS	VERF
47.	KAR	FIETS	VRAGMOTOR
48.	BLOM	GRAS	SLANG

## Appendix D: Background information

1. Age \_\_\_\_\_ 2. Gender \_\_\_\_\_ 3. Race/Ethnicity \_\_\_\_\_

4. Which language was spoken (around you) by your parents/caregivers in your household?

1 = Only Afrikaans

2 = Both English and Afrikaans

3 = Only English

5. Which language was spoken to you by your parents/caregivers (when engaging in conversation)?

1 = Only Afrikaans

2 = Both English and Afrikaans

3 = Only English

6. Please estimate how many hours a week you speak Afrikaans: \_\_\_\_\_

7. Please estimate how many hours a week you speak English (if you do):  
\_\_\_\_\_

8. At which age did you first learn English? \_\_\_\_\_

9. How did you learn English? \_\_\_\_\_

10. How do you rate your proficiency with Afrikaans reading? (please select the appropriate number)

1 <----- 2 ----- 3 ----- 4 ----- > 5

Basic

Excellent

11. How do you rate your proficiency with Afrikaans writing? (please select the appropriate number)

1 <----- 2 ----- 3 ----- 4 ----- > 5

Basic

Excellent

12. How do you rate your proficiency with Afrikaans speaking? (please select the appropriate number)

1 <----- 2 ----- 3 ----- 4 ----- > 5

Basic

Excellent

13. How do you rate your proficiency with English reading? (please select the appropriate number)

1 <-----2-----3-----4-----> 5

Basic

Excellent

14. How do you rate your proficiency with English writing? (please select the appropriate number)

1 <-----2-----3-----4-----> 5

Basic

Excellent

15. How do you rate your proficiency with English speaking? (please select the appropriate number)

1 <-----2-----3-----4-----> 5

Basic

Excellent

16. If you were tested in English please indicate, as a percentage (%), how much of the tasks you comprehended (if you were tested in Afrikaans, proceed to the next question)

*0-100 drop down menu*

17. What do you believe influenced you the most to make the decision you did in the hypothetical scenario? \_\_\_\_\_

**Appendix E: Consent form**

CONSENT TO PARTICIPATE IN RESEARCH		
Dear Prospective Participant		
<p>My name is Taryn Dick, I am a student at the University of Stellenbosch, and I would like to invite you to take part in a survey, the results of which will contribute to my research project for my Master's degree in General Linguistics.</p> <p>Please take some time to read the information presented here, which will explain the details of this project. Your participation is entirely voluntary and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.</p> <p>You are invited to participate in an online, psycholinguistic study that deals with decision making during scenarios, as well as a word classification/categorisation task. If you are a first language speaker of Afrikaans, with English as your second language, between the ages of 18 to 40 years, you qualify to participate in the study. You need not be able to fluently speak English, nor to communicate in it frequently. If you participated in the Honours thesis conducted last year on moral dilemmas, please note you will not be able to participate in the current research.</p> <p>The survey will take approximately 35-40 minutes to complete and contains a hypothetical scenario in which you will have to make a decision (either in Afrikaans or English), a background questionnaire, and a debriefing questionnaire. The background questionnaire will ask basic questions about you and the languages you speak, whereas the debriefing questionnaire will ask you questions about the scenario you responded to. No identifiable information will be asked of you in this study, and you will remain anonymous throughout. (Once you have completed the debriefing questionnaire you will be given the opportunity to take part in the lucky draw, where you could win one of five R500 cash vouchers).</p>		
<p><b>RIGHTS OF RESEARCH PARTICIPANTS:</b></p> <p>You have the right to decline answering any questions and you can exit the survey at any time without giving a reason. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have any questions regarding your rights as a research participant, contact Mrs Maléne Fouché [mfouche@sun.ac.za; 021 812 4622] at the Division for Research Development.</p>		
<p>Your information and response to the survey will be protected by storing the data in a password protected folder on a personal laptop.</p> <p>If you have any questions or concerns about the research, please feel free to contact the researcher Taryn Dick at <a href="mailto:18999506@sun.ac.za">18999506@sun.ac.za</a> and/or the Supervisor, Professor Manne Bylund at <a href="mailto:mbylund@sun.ac.za">mbylund@sun.ac.za</a>.</p> <p>Please feel free to print a copy of this consent form to keep for your own records.</p>		

<b>I confirm that I have read and understood the information provided for the current study.</b>	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
<b>I agree to take part in this survey.</b>	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>

## Appendix F: Invitation on SunLearn

(The invitation was initially sent in Afrikaans only, but an English version was sent out at a later stage).

### English

Dear Student

You have been invited to take part in a survey, the results of which will contribute to my research project for my Master's degree in General Linguistics. If Afrikaans was the first language you learned, followed by English, and you are between the ages of 18 to 40 years, you qualify to participate in the study. The survey is an online, psycholinguistic study (presented in either in Afrikaans or English) that deals with decision making during scenarios, as well as a word classification/categorisation task - and takes approximately 30-40 minutes to complete.

Once you have completed the survey you will be given the opportunity to take part in the lucky draw, where you could win **ONE OF TEN R200 cash vouchers**. You will have to provide a preferred contact number for the entry. PLEASE NOTE: YOU ARE ONLY ALLOWED TO PARTICIPATE IN THE STUDY AND ENTER THE DRAW ONCE - ANY DOUBLE ENTRIES WILL NOT BE CONSIDERED.

Your participation is entirely voluntary and you are free to decline to participate. No identifiable information will be asked of you in this study, and you will remain anonymous throughout.

### Afrikaans:

*Beste student*

*U is uitgenooi om aan 'n opname deel te neem, waarvan die resultate bydra tot my navorsingsprojek vir my magistergraad in algemene taalkunde. As Afrikaans die eerste taal was wat u geleer het, gevolg deur Engels, en u tussen 18 en 40 jaar oud is, kwalifiseer u om aan die studie deel te neem. Die opname is 'n aanlyn-psigolinguistiese studie (aangebied in Afrikaans of Engels) wat handel oor besluitneming tydens scenario's, sowel as 'n woordklassifikasie / kategoriseringstaak - en dit neem ongeveer 30-40 minute om te voltooi.*

*Nadat u die opname voltooi het, kry u die geleentheid om aan die gelukkige trekking deel te neem, waar u EEN VAN TIEN R200 kontantbewyse kan wen. U moet 'n voorkeur-kontaknommer vir die inskrywing verskaf. LET WEL: U mag slegs aan die studie deelneem en die trekking een keer inskryf - ENIGE DUBBELE INSKRYWINGS SAL NIE OORWEEG WORD NIE.*

*U deelname is geheel en al vrywillig en u is vry om te weier om deel te neem. Geen identifiseerbare inligting word tydens hierdie studie van u gevra nie en u sal deurgaans anoniem bly.*



## Appendix G: Invitation for Facebook, Instagram and WhatsApp

Complete the following research survey and stand a chance to **win one of ten R200 cash vouchers**

**All you need to participate is to:**

- have learned Afrikaans as your first language and English as your second
- be between the ages of 18 - 40 years

Please feel free to share the link with anyone who qualifies to participate

It shouldn't take longer than 20 minutes to complete!

**Appendix H: Item scores for visualisation task (SHAPE)**

ENGLISH GAIN FRAME	SHAPE 1 (24)	SHAPE 2 (24)
1	23	24
2	21	21
3	21	19
4	10	9
5	22	22
6	20	19
7	24	24
8	19	18
9	24	24
10	23	23
11	24	23
12	7	24
13	23	24
14	20	19
15	23	22
16	24	23
17	21	22
18	20	11
19	24	19
20	23	23
21	20	19
22	21	24
23	23	20
24	22	22
25	22	21
26	7	10
27	24	21
28	24	22
29	23	24
30	22	23
31	24	22
32	22	9
33	23	17
34	22	23
35	23	24
36	6	14
37	8	10
38	23	23
39	21	21
40	24	24
41	20	24
42	24	23
43	24	22

ENGLISH LOSS FRAME	SHAPE 1 (24)	SHAPE 2 (24)
44	23	23
45	23	20
46	22	22
47	10	10
48	20	23
49	16	22
50	23	23
51	17	23
52	23	22
53	20	23
54	23	22
55	23	23
56	10	18
57	16	21
58	23	23
59	20	21
60	8	20
61	22	21
62	19	19
63	23	22
64	23	23
65	21	18
66	21	22
67	21	22
68	17	21
69	22	20
70	23	12
71	23	23
72	21	20
73	10	21
74	20	19
75	23	20
76	14	22
77	24	23
78	18	22
79	11	20
80	21	22
81	4	21

<b>AFRIKAANS GAIN FRAME</b>	<b>SHAPE 1 (24)</b>	<b>SHAPE 2 (23)</b>
<b>82</b>	23	12
<b>83</b>	22	12
<b>84</b>	20	12
<b>85</b>	22	13
<b>86</b>	22	13
<b>87</b>	22	14
<b>88</b>	17	12
<b>89</b>	10	16
<b>90</b>	7	9
<b>91</b>	24	14
<b>92</b>	10	12
<b>93</b>	23	12
<b>94</b>	21	14
<b>95</b>	11	5
<b>96</b>	21	12
<b>97</b>	23	14
<b>98</b>	23	14
<b>99</b>	21	14
<b>100</b>	12	15
<b>101</b>	22	15
<b>102</b>	18	13
<b>103</b>	23	11
<b>104</b>	20	12
<b>105</b>	23	13
<b>106</b>	21	10
<b>107</b>	20	8
<b>108</b>	22	13
<b>109</b>	15	11
<b>110</b>	21	14
<b>111</b>	21	12
<b>112</b>	24	13
<b>113</b>	15	9
<b>114</b>	22	12

<b>AFRIKAANS LOSS FRAME</b>	<b>SHAPE 1 (23)</b>	<b>SHAPE 2 (24)</b>
<b>115</b>	20	21
<b>116</b>	17	22
<b>117</b>	12	18
<b>118</b>	13	23
<b>119</b>	6	19
<b>120</b>	19	24
<b>121</b>	18	23
<b>122</b>	17	21
<b>123</b>	14	23
<b>124</b>	10	20
<b>125</b>	19	21
<b>126</b>	7	12
<b>127</b>	15	14
<b>128</b>	9	7
<b>129</b>	21	20
<b>130</b>	11	20
<b>131</b>	19	20
<b>132</b>	13	21
<b>133</b>	12	20
<b>134</b>	5	16
<b>135</b>	20	17
<b>136</b>	15	22
<b>137</b>	21	22
<b>138</b>	11	10
<b>139</b>	7	22
<b>140</b>	8	21
<b>141</b>	17	19
<b>142</b>	9	10
<b>143</b>	16	21
<b>144</b>	9	21
<b>145</b>	17	8